United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with United States Department of Interior, National Park Service

Utah Agricultural Experiment Station

Soil Survey of Arches National Park, Utah

How To Use This Soil Survey

The information provided in this publication can be useful in planning the use and management of small areas. The text includes descriptions of detailed soil map units and provides an explanation of the information presented in the tables. The publication also includes a glossary of terms used in the text and tables and a list of references. Bookmarks and links in the publication allow the user to navigate from one part of the text to another. Maps showing soil lines and map unit symbols can be accessed for a particular area of interest through the Web Soil Survey of the Natural Resources Conservation Service, accessible at http://websoilsurveynrcs.usda.gov/app/. The symbols on the map represent the detailed soil map units in the area. These map units are listed in the bookmarks panel of the text. Information about the map units can be accessed by clicking on the appropriate bookmark.

The bookmarks panel corresponds to the Contents and allows the user to navigate easily throughout the book.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was initiated in 2006, and completed in 2008. Soil names and descriptions were approved in 2008. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2008. This survey was made for Arches National Park, Utah, by the Natural Resources Conservation Service in cooperation with the National Park Service.

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Cover: View of Double O Arch in Arches National Park, map unit 85.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov.

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Foreword

This soil survey was developed in conjunction with the National Park Service Inventory and Monitoring Program and is intended to serve as the official source document for soils occurring within Arches National Park.

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Planners and engineers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in ecology, recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey, sandy, or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations. These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil.

Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service, as well as the National Park Service Natural Resources Program Center.

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Soil Survey of
Arches National Park, Utah

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with United States Department of the Interior, National Park Service

General Nature of the Survey Area

Arches National Park is located in Grand County in southeastern Utah and consists of 76,519 acres (fig. 1). President Herbert Hoover, in an effort to protect the natural arches, balanced rocks, and other rock formations of this unique area, established Arches National Monument in 1929. It became Arches National Park in 1971. The area is irregular in shape and consists of valleys, mesas, cuestas, and drainageways.

Arches National Park is located in the southern portion of Grand County. It is bordered on the southeast by the Colorado River and on the southwest by Highway 191. A 48-mile round-trip paved road provides excellent visitor access to the park's features. There are also approximately 27 miles of non-paved roads and 18 named trails totaling over 30 miles in length.

The Park can be accessed by US Highway 191, which connects Interstate Highway 70 and La Sal Junction. The closest towns to the Park are Moab, Utah (population 4,868), 5 miles to the south; and Green River, Utah (population 921), 47 miles to the northwest. The area between these towns is extremely rural, with widely scattered ranches.

Physiography

Arches National Park is located in the Canyon Lands section of the Colorado Plateau. Salt Wash enters the Park in the northeastern corner and exits in the southeastern portion, flowing into the Colorado River. Salt Valley Wash, Winter Camp Wash, and Cache Valley Wash all flow into the larger Salt Wash. Courthouse Wash, which also flows into the Colorado River, enters the Park in the southwest section and exits near the southernmost portion. Another major physiographic feature of the Park is Salt Valley, which stretches from the northwestern border to near the center of the Park. Other physiographic features of note include Eagle Park, Klondike Bluffs, and Devils Garden in the northwest section; Fiery Furnace, Winter Camp, and Cache

Figure 1.—Location of Arches National Park in Utah.

Valley in the northeast section; Willow Flats, Herdina Park, The Great Wall, and Courthouse Towers in the southwest section; and The Windows and Petrified Dunes in the southeast section. The highest point in the Park is on Elephant Butte, in The Windows section, at 5,659 feet (1,725 meters). The lowest point is where Courthouse Wash exits the Park at its southern edge, at 3,957 feet (1,206 meters). Natural water sources are intermittent in nature and include numerous springs and seeps; water also collects in bedrock potholes after rains. Most of the washes have water only following significant rainfall.

Climate

Climate tables are created from climate station Arches National Park HQ, Utah. Thunderstorm days, relative humidity, and percentage of sunshine are estimated from First Order station, Grand Junction, Colorado. Wind information is estimated from information for Moab-Canyonlands Airport.

Most of the soil survey area is on a plateau at elevations of 4,600 to more than 5,300 feet. The collapse valleys of Salt Valley and Cache Valley range in elevation from 4,200 to 5,000 feet. The park headquarters and the weather station are located in Moab Canyon at an elevation of 4,130 feet. Given that the weather station is at a relatively low elevation, surrounded by cliffs, and has good air drainage down to the adjacent Spanish Valley, it is assumed to be one of the warmer areas in the survey area.

Table 1 gives data on temperature and precipitation for the survey area as

recorded at Arches National Park Headquarters in the period 1980 to 2000. Extremes mentioned in the narrative are based on the entire period of record, 1980 to 2007. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 33 degrees F and the average daily minimum temperature is 22 degrees. The lowest temperature on record, which occurred on February 6, 1989, is -8 degrees. In summer, the average temperature is 79.9 degrees, and the average daily maximum temperature is 95.5 degrees. The highest recorded temperature, which occurred on July 13, 2003, is 116 degrees.

Growing degree days are shown in table 3. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 9 inches. Of this, 4 inches, or 50 percent, usually falls in April through September. The growing season for most plants falls within this period. In 2 years out of 10, the rainfall in April through September is less than 2 inches. The heaviest 1-day rainfall during the period of record was 1.62 inches on September 8, 2002. Thunderstorms occur on about 36 days each year, and most occur in July and August.

The average seasonal snowfall is about 6 inches. The greatest snow depth at any one time during the period of record was 10 inches. On the average, 14 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 35 percent. Humidity is higher at night, and the average at dawn is about 60 percent. The sun shines 79 percent of the time possible in summer and 62 percent in winter. The prevailing wind is from the west. Average windspeed is highest, 9.2 miles per hour, in April.

Vegetation

Arches National Park is within MLRA 35–Colorado and Green River Plateau. MLRA 35 occurs in Arizona (56 percent), Utah (22 percent), New Mexico (21 percent), and Colorado (1 percent). It makes up about 71,735 square miles (185,885 square kilometers). The cities of Kingman and Winslow, Arizona; Gallup and Grants, New Mexico; and Kanab and Moab, Utah, are in this area. The Grand Canyon and Petrified Forest National Parks, and the Canyon de Chelly and Wupatki National Monuments are in the Arizona part of this MLRA. The Zion, Capitol Reef, Canyonlands, and Arches National Parks, and the Grand Staircase-Escalante and Hovenweep National Monuments are in the Utah part. The Aztec Ruins, El Morro, El Malpais, and Chaco Canyon National Monuments and Chaco Culture National Historic Park are in the New Mexico part.

Currently, MLRA 35 in Utah is not subdivided by land resource units (LRUs). Most of the area is characterized by both tilted and horizontal beds of Cretaceous, Jurassic, Triassic, Permian, and Pennsylvanian rocks. The rocks have been eroded into plateaus, mesas, hills, and canyons. In the Arches National Park vicinity, dominant exposed geologies include the Moab Tongue, Main Body, and Dewey Bridge Members of the Entrada Formation; Brushy Basin, Salt Wash, and Tidwell Members of the Morrison Formation; and the Navajo, Kayenta, Wingate, and Chinle Formations of the Glen Canyon Group.

At Arches National Park, the annual mean precipitation is approximately 9 inches. However, the annual precipitation can range from 7 to 11 inches. Much of the rainfall occurs as convective storms in late summer; about 10 to 30 percent of the total precipitation falls in July and August. Snowpacks are generally light and not

persistent throughout the winter. The average annual temperature ranges from 53 to 57 degrees F. The frost-free (<32°F) period averages 185 days and ranges from 170 to 200 days. The soil temperature regime is mesic, and the soil moisture regimes are ustic aridic and typic aridic.

On the flood plains, flood-plain steps, and riparian corridors in the canyons and drainageways, the dominant plant species include coyote willow, Fremont cottonwood, and inland saltgrass. On the stream terraces above the current floodplain, dominant plants include fourwing saltbush, basin big sagebrush, greasewood, seepweed, Fremont cottonwood, and annual and perennial grasses and forbs. On the mesas and cuestas, the dominant vegetation includes blackbrush, sand sagebrush, Mormon tea, twoneedle pinyon, and Utah juniper, with an understory of perennial bunch grasses and forbs. In areas that receive higher run-in moisture, there is also Stansbury cliffrose, littleleaf mountain-mahogany, Bigelow sagebrush, and singleleaf ash. Sandier areas have sand sagebrush, resinbush, rosemary mint, and Havard oak. In the valleys, the dominant species include fourwing saltbush, winterfat, blackbrush, Mormon tea, and annual and perennial grasses and forbs. On the hills and cuestas created by the collapse of the salt dome (which was primarily responsible for the unique assemblage of geological diversity in the Park) the primary species include blackbrush, mat and valley saltbush, bud sagebrush, annual and perennial grasses, and forbs.

Geology

Stratigraphy

Bedrock strata exposed within Arches National Park span nearly 200 million years of the geologic time scale, ranging from the Middle Pennsylvanian Paradox Formation to the Late Cretaceous Mancos Formation. Highly variable in chemical, physical, and morphological composition, these sedimentary units in large part drive the soil properties that mirror the attendant geologic parent material. Marine deposits such as the Mancos and Paradox Formations yield soils rich in evaporite minerals and fine (clay- and silt-sized) particles. The soils found in these areas are of the Persayo, Hanksville, Retsabal, and Somorent series. Eolian and fluvial sand deposits that created the massive sandstone cliffs, arches, and petrified dunes of the Wingate, Entrada, and Navajo sandstones weather locally to produce sand sheets and dunes comprised of soils given series names ubiquitous to the area (Mido, Arches, Pensom). Sandstones of more variable composition include the Dewey Bridge Member of the Entrada Formation and the Tidwell Member of the Morrison Formation; these units have lenses of siltstone, mudstone, and arenaceous limestone that produce soils less sandy than their eolian counterparts. Soil series mapped on these members include the Remorris and Simel series. Figure 2 depicts a generalized schema of the geologic units represented in the Park. Members of some formations are assigned differently by geologists; for example the Dewey Bridge and Tidwell Members of the Entrada formation are considered part of the Carmel and Curtis Formations by the schema below.

Paleozoic Era

The oldest exposed consolidated sedimentary rocks in the Park are the Pennsylvanian-aged (about 290 million years old) Paradox and Honaker Trail Formations. These strata are largely responsible for the overall appearance of Arches; this salt-bearing deposit was laid down in 29 cycles of deposition during which marine sediments settled to form carbonaceous shales, gypsum, and limestone (Doelling, 2003). With cyclical restrictions of ocean water, evaporite

minerals formed in the exposed marine floor basins (Chronic, 2002). Exposed Paradox "caprock" exists in Salt and Cache Valleys within the Park; this appears as contorted shales, gypsum, and limestone beds that are devoid of salt deposits. Halite, carnallite, and sylvite underlie the caprock in the salt-cored anticline. Stagnant water deposits are evidenced by black shale deposits from this era. The Honaker Trail Formation consists primarily of limestone and sandstone that reflect a period of ocean water circulation devoid of salt deposition (Doelling, 2003). These deposits coincided with uplift of the Uncompahgre highlands to the east as this portion of the ancestral Rockies shed sediments that travelled westward.

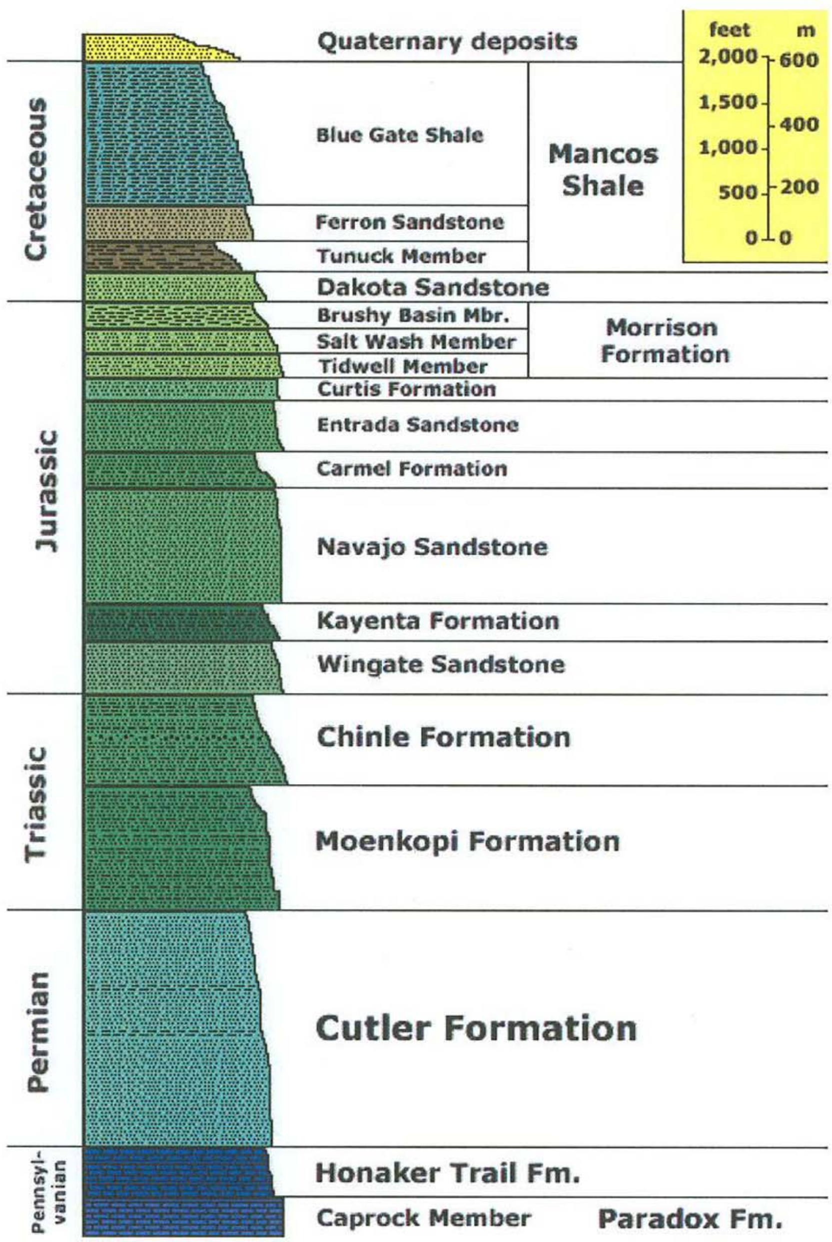

Figure 2.—Geologic Period, name, and thickness of strata exposed in the vicinity of Arches National Park (USGS.gov, modified 5/6/2006).

Mesozoic Era

Triassic-, Jurassic-, and Cretaceous-aged strata form the bulk of exposed sedimentary geology in Arches and account for the majority of the natural features (arches, fins, and petrified dunes) that attract visitors to the park. From a soils perspective, the eolian sandstones of this era serve as the parent material for the sand-dominated textures of soils in the Park. Mesozoic strata can be divided into massive cliff-forming units (the Wingate, Navajo, and Entrada [Main Body/Slickrock Member] sandstones), soft-sediment slope formers (the Chinle, Morrison [Brushy Basin Member], and Mancos formations), and ledge/bench forming units (the Kayenta, Morrison [Salt Wash and Tidwell Members], and Entrada [Moab Tongue Member] Formations. An account of the exposed geologic formations and their respective members follows.

Triassic Period

Moenkopie Formation. The distinctive “chocolate” brown redbeds of silty sandstone, sandy mudstone, siltstone, and shale form alternating slopes and ledges in the areas of exposed Triassic rocks in Arches National Park. Ripple-marked surfaces help geologists discern the flat, fluvial deposition environment in which the Moenkopie was deposited (Doelling, 2003). There is very little Moenkopie Formation exposed within the Park, and it does not contribute significantly to the soil development in the Park.

Chinle Formation. This formation is composed of many multi-colored layers which include conglomerate, siltstone, mudstone, and sandstone (fig. 3). The origins of the Chinle layers are primarily fluvial, laid down in flood plains of meandering streams and in lake bottoms; however, there are also some intermittent layers of wind-blown ash from Arizona and sandstone layers with cross-bedding, implying eolian origin

Figure 3.— An exposure of the Chinle Formation.

Figure 4.— An exposure of the Kayenta Formation.

(Barnes, 1978; Doelling, 2003). The soils in the Park that weather from this material are loamy and highly calcareous. Good exposures of the Chinle formation in the Park may be observed along the lower southern margins of Salt and Cache Valleys.

Wingate Formation. The Wingate Sandstone exposures in Arches National Park are often characterized by massive cliffs liberally stained with desert varnish. The Wingate Formation, a massive, eolian-origin sandstone, is situated directly above the Chinle Formation. Slabs of Wingate regularly fall from the cliffs onto the Chinle slopes below, covering the lower formation with boulders. This calcareous sandstone generally ranges from orange to brown in color, and consists of quartz with small amounts of feldspar, chert, and other minerals. The grains are rounded and moderately well sorted, as is common with wind deposits (Doelling, 2003).

Kayenta Formation—Overlying the massive sections of Wingate sandstone is the shelfy Kayenta Sandstone Formation (fig. 4). The reddish/purplish sandstone consists of mainly quartz grains with some mica and feldspar. The sandstone originates mainly from stream deposits, with some eolian layers included as well (Doelling, 2003). Soils that develop from this material may be either loamy or sandy, the result of variability within the sandstone itself. Exposures of this formation may be observed in numerous area throughout the Park.

Navajo Sandstone. One of the most ubiquitous formations in Arches National Park is Navajo Sandstone. Lying directly over the Kayenta Formation, it is remarkable in that one can easily see the original shape of the dunes from which it was formed (fig. 5). The dune forms show clear cross-bedding, much of it high-angle. The large Navajo Sandstone expanse in the southeastern portion of the Park is aptly named the “Petrified Dunes.” The sandstone itself is mostly gray in color, with fine-to-coarse quartz grains cemented by calcite and quartzite (Doelling, 2003). The soils that develop from this formation are predictably sandy.

Figure 5.— Navajo Formation Sandstone showing crossbedding, revealing its origins in sand dunes.

Entrada Sandstone

Dewey Bridge Member. Most of the Dewey Bridge exposed in the Park is reddish-brown in color and relatively fine-grained, consisting of fine sands and silts deposited in ancient tidal flats and shallow seas. It directly overlies the Navajo Sandstone and is capped in some areas by a thin bed of gray limestone (Doelling, 2003). In the Park, it is evident as the base of Balanced Rock, and can be seen at the bottom of the towering cliffs of the Great Wall and other similar features (which are made from the Main Body Member of Entrada Sandstone). Because of this sandstone's generally "muddy" constituents of fine sands and silts, the soils that develop are loamy in nature; they also tend to be strongly calcareous.

Main Body Member. This member of Entrada Sandstone is responsible for the formation of the most visually stunning features of the Park, the "arches" themselves (fig. 6). It is highly visible from the main road through the park, making up The Great Wall, The Windows, the base of Delicate Arch, the fins of the Fiery Furnace, and the Marching Men (fig. 7, fig. 8). These features often tower a few hundred feet above the main level of the Park. The massive sandstone, mainly eolian in origin, is made of fine-grained reddish and orangish-brown sands cemented with calcite and iron-oxides (Doelling, 2003). The source for the soils that form on and around this sandstone is often local eolian sands from the Entrada itself.

Moab Tongue Member. This sandstone member of Entrada, where present, caps the Main Body Member of Entrada (fig. 9). The Moab Tongue Member covers large portions of the dipslopes of the cuestas on either side of Salt Valley; one slopes to the northeast, and the other to the southwest. It also is the caprock on Delicate Arch, perched above the Main Body pillars. This sandstone is light-colored, dominantly gray with hints of oranges and yellows. It is made of fine and medium-sized grains of calcareous sand, massive and strongly-cemented (Doelling, 2003). The soils that

Figure 6.— Main Body Member of the Entrada Formation Sandstone, taking the form here of The Three Gossips.

Figure 7.— Landscape of map unit 85 (Rock outcrop-Mident family-Mido complex, 15 to 30 percent slopes). The rock outcrop in this map unit is the Main Body Member of Entrada Formation Sandstone, seen here in the form of “fins.”

Figure 8.— Main Body Member of the Entrada Formation Sandstone, seen here forming The Windows.

form on this sandstone are from local eolian material, and tend to be sandy and siliceous in nature.

Morrison Formation

Summerville Formation or Tidwell Member, undifferentiated. This maroon-colored siltstone (fig. 10) is present in the Park on the cuestas bordering Salt Valley. Mudstone and gypsum are also present in this material (Barnes, 1978). It overlies the Moab Tongue Member of Entrada. The ripply siltstone (fig.11), belying its probable origin as fluvial lake deposits, is interbedded with thin beds of gray limestone. Large chert concretions are common in this material as well (Doelling, 2003), which weather into piles of scattered chert fragments on the surface (fig.12). The Tidwell Formation weathers to a loamy, calcareous soil.

Salt Wash Member. This sandstone is light-colored (grays, yellows, browns) and contains layers of red and green muddy siltstone and limestone (fig.13). The shale layers weaken this material, which allows it to break into large chunks, especially near the edges (Doelling, 2003). The Salt Wash formed in lakes and on flood plains, and also contains quantities of volcanic ash (Barnes, 1978). The soils that form from this material vary; sandy colluvial soils develop from the thick sandstone layers, and loamy or clayey residual soils form in the siltstone and mudstone layers.

Brushy Basin Member. This colorful layer overlies the Salt Wash Member and is visible in Arches National Park at the southeastern tip of Salt Valley and the north side of Cache Valley. The deposits are visible here as a result of salt dome collapses, which resulted in jumbles of geological material being deposited out-of-sequence at the edges and bottoms of these valleys. Brushy Basin is comprised of layers of gray sandstone, dark conglomerate and conglomeratic sandstone, and bright green, maroon, lavender, and gray mudstone (fig.14). There is also a considerable amount of volcanic ash in this material, which has weathered into the siltstones, and

Figure 9.— The Moab Tongue Member of the Entrada Formation Sandstone.

Figure 10.—Exposure of the Tidwell Member of the Morrison Formation.

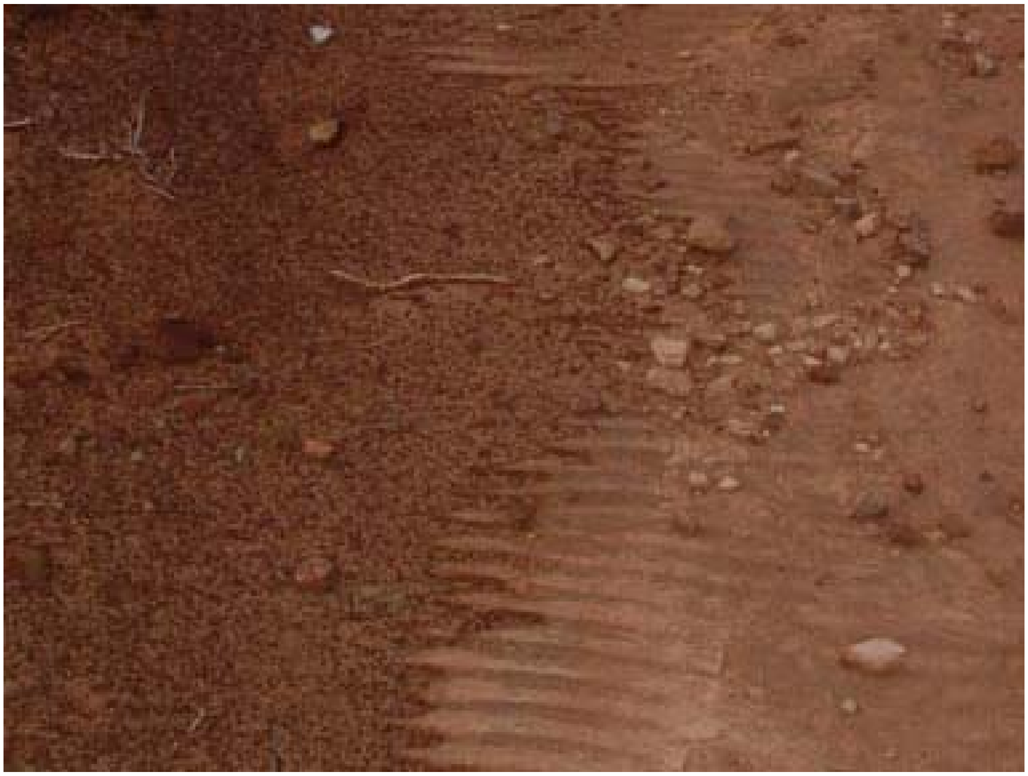

Figure 11.— Tidwell Member of the Morrison Formation, showing typical ripple-marks.

Figure 12.— Chert fragments weathered from concentrations within the Tidwell Member of the Morrison Formation.

Figure 13.—An exposure of the Salt Wash Member of the Morrison Formation, showing the multicolored siltstone and shale interbedded with more resistant sandstone.

Figure 14.— The Brushy Basin Member of the Morrison Formation is often greenish-blue in color.

numerous fossils and petrified wood may be found (Doelling, 2003). Brushy Basin Member is primarily fluvial in nature, forming in lakes, streams, and flood plains (Barnes, 1978). The soils that form from this material are loamy or clayey in nature.

Cretaceous Period

Cedar Mountain Formation. This formation is made of sandstone, shale, limestone, and conglomerate, and was laid down in a fluvial environment of lakes, streams, and flood plains (fig. 15) (Barnes, 1978). The sandstone layers are brown and strongly indurated; the shale layers are similar to those in Brushy Basin but not as brightly colored and not so laden with clay (Doelling, 2003).

Dakota Sandstone. This layer is composed mainly of sandstone (fig. 16), but also includes limestone, shale, coal, and conglomerate; the origin is coastal (Barnes, 1978). It appears in the Park at the southeastern end of Salt Valley and along the north side of Cache Valley as a relatively thin, steeply tilting hogback (Doelling, 2003).

Mancos Shale. Although it consists predominantly of shale of marine origin, this layer also contains thin sandstone layers. It can be seen in hills in Cache Valley fig. 17) and at the southeast end of Salt Valley, as a result of the salt dome collapse. There are several distinct layers within Mancos Shale which have been identified in detailed geological studies; the 1985 geology map by Doelling splits it out into Upper Mancos Shale, Ferron Sandstone Member, and Lower Mancos Shale (Doelling, 1985). The shale layers are predominantly gray and grayish-black, calcareous, and fossiliferous (fig. 18) (Doelling, 2003). The soils that develop from the Mancos tend to be loamy or clayey, often with significant salt and gypsum (fig. 19) accumulations.

Figure 15.—An exposure of Cedar Mountain Formation Sandstone.

Figure 16.—An exposure of Dakota Formation Sandstone.

Figure 17.—Landscape of the Persayo soil component in map unit 119 (Persayo-Somorent family complex, 15 to 70 percent slopes). The parent material in this map unit is residuum from Mancos Shale.

Figure 18.—Surface of Persayo soil component in map unit 119 showing shell fossils and travertine fragments, common in the Mancos Shale from which this soil developed.

Figure 19.—Surface of Persayo soil component in map unit 119 showing gypsum crystals, common in the Mancos Shale from which this soil developed.

Cenozoic Period

A significant portion of Arches National Park is covered with Quaternary-aged material. Eolian sand can be found anywhere that provides a stable surface for it to reside (fig. 20). Alluvial deposits, both recent and old, occupy the drainageways and much of the valley surface within the Park (fig. 21). The alluvial deposits are mostly sand, but layers of gravel, silt, and clay may also be found (Doelling, 1985). Quaternary gravel deposits are present in Salt Valley. The soils that develop from the Quaternary deposits range from very sandy to coarse-loamy, depending upon the nature of the material from which they developed.

Salt Domes, Fins, and Arches

Perhaps the most important structural component in the history of the geology and resulting geological structures of Arches National Park was the influence of salt deposition and removal that began some 300 million years ago. Gypsum, potash, and other salts were deposited in a basin known as the Paradox and were eventually covered over with later sediment layers. Under pressure, the salts became plasticized, and having a lower specific gravity than the overlying sediments, were squeezed upwards along faults or other planes of weakness (Doelling, 2003). Northwest to southeast-trending anticlines were the result, with the formations overlying the bulging salt domes forced upward (Chronic, 2002). Eventually, fresh water found its way into the supportive salt domes, and much of the salt was dissolved and carried away. Anticline collapses resulted in the formation of grabens following the original lines of the faults, and much younger rock tumbled into the newly-created valleys. While much of resulting detritus has been removed in subsequent times, there are still remnants of Cretaceous-aged formations present in Salt and Cache Valleys.

One result of the bulging ancient salt domes was the subsequent jointing and cracking of the geology which has remained on the cuestas to the sides of the Cache and Salt Valleys. Some of these joints have been widened and eroded to the point that deep crevasses in the original formations have resulted, appearing as impressive Entrada “fins” in Arches National Park. Through water and wind erosive processes that exploit points of weakness in the fins, many alcoves and eventually arches may result, giving this park its unique geological look and feel (Chronic, 2002).

Soils Overview

All soil development depends on the interaction of five soil-forming factors: parent material, climate, biota (living organisms and their residues), topography, and time. In Arches National Park, the variety of soils that occur across the landscape can be explained by differences in these five factors. One factor of particular importance in the Park is the influence of parent material, or the deposits from which the soils originated. In soils that have relatively little pedogenic development (75 percent of the identified soils in the park are Entisols), parent material contributes even more to the soil that results (Miller and Donahue, 1990). Another important factor in the Park is the length of time the materials have been stable in place in order for biota and climate (precipitation and temperature) to affect the parent material. The longer the material has remained stable in place, the more “weathering” of the material may occur, resulting in increased pedogenesis. This weathering of materials depends heavily on available moisture, of which the climate in the Park offers little; weathering rates in relatively dry environments such as Arches National Park tend to be slow. Topography in the Park also has an effect on this weathering rate; soils on steep slopes tend to have less water movement down through the soil profile (the result of higher runoff), and thus pedogenesis is slowed. Steep soils also tend to be less

Figure 20.—An example of Quaternary-aged sand dunes.

Figure 21.—Quaternary-aged alluvial deposits showing stratified sand and gravel layers.

stable because the parent material is more likely to be moved downslope by gravitational forces and slope-wash, and so the factor of time plays a somewhat sporadic role, with pedogenesis being interrupted whenever the nascent soil slides down the hill or is blown about in strong winds.

The soils in Arches National Park can be broken down into three main categories based on parent material: eolian (wind-blown), alluvial (water-borne), and residual (weathered in place). Colluvial soils (transported by gravity) will be discussed with the residual soils.

Eolian soils

Soils of eolian origin are a major constituent of the suite of soils in Arches National Park. These wind-blown materials (mainly fine sands) are highly variable in origin; some materials come from many miles away and others are produced very locally, even within the park, from the local rock outcrops. Some nearby samples of eolian material in Canyonlands National Park have been dated to 46,000 years ago, with depositional events continuing up to the present day in varying degrees of intensity (Reynolds et al., 2006). The variability in these sources can readily be observed in the different colors of sand deposits present throughout the Park.

Eolian soils are found throughout Arches National Park on any surface that provides enough stability to the shifting sands for plants to take root. Small landforms called shrub-coppice dunes form around these pioneering plants, often shrubs or small group of shrubs (fig. 22). An example of this is the Arches component in map unit 126. One ecological site often associated with this landform is Shallow Sand Rock Pocket (Utah Juniper/Pinyon). Climbing dunes form where the sands accumulate against a large structure, usually a rock wall or other outcrop, and form a sand “ramp” that becomes vegetated, although often sparsely. An example of this within the Park is the Mido, dune component of map unit 91 (fig. 23). Ordinary “dunes” are intermediate in size between shrub-coppice dunes and climbing dunes, and vary from moderately active and sparsely vegetated structures to grass- and shrub-covered mounds that are fairly stable (fig. 24). The soils that form on these various types of dunes are generally young and weakly- (or un-) developed. The textures are predominantly fine sand and loamy fine sand throughout. Soil structure is usually weak or nonexistent. Sands are usually loose and non-cemented. The ecological site most associated with this landform is Semidesert Sand (Dune).

A second group of eolian soils is found in interdune areas, in close association with dunes (essentially, between the dunes) or on relatively stable sand sheets. These soils are also of wind-blown origin, but occupy positions of relative stability. The soils in these interdune spaces or on broad vegetated sand sheets, although still primarily composed of sand, are usually more “developed” than the dune sands; that is, either they have weak structure or they are massive rather than loose and single-grained. Some may have zones of calcium carbonate accumulation, or Bk horizons. While the dunes surrounding them may shift over time and reconfigure their sand grains, these soils in the slightly more stable landscape position of interdune or sand sheet remain. These areas may experience periods of erosion and deposition of sand over time, but a certain amount of more stable soil material remains and continues to weather and develop some level of pedogenesis. An example of this type of soil in the Park is the Mido, strongly calcareous component in map unit 103. One ecological site often associated with this type of interdune area is Semidesert Sand (Blackbrush). This soil component has remained in a stable position for a long enough period that there has been some translocation of calcium carbonate downward through the sands of the profile. The accumulation can be detected by testing for a strong or violent effervescence reaction with cold dilute hydrochloric acid.

A third group of “eolian” soils is found in areas where eolian sands and slope

Figure 22.—An example of a shrub-coppice dune.

alluvium have intermingled and combined over time into relatively smooth sand sheets. In these areas, the influence of local slope alluvium can be detected by the presence of thin lenses of coarser sands (sometimes with fine gravel included), or finer materials such as silts, interspersed with the usual fine sands of eolian origin. A good example of this is map unit 108, which includes a Mido, strongly calcareous component of predominantly eolian origin, interspersed with the Milok component of mixed eolian/slope alluvium origin. The ecological sites most often associated with these soil types are Semidesert Sand (Fourwing Saltbush) and Semidesert Sandy Loam (Fourwing Saltbush). Although the Mido, strongly calcareous component is very sandy, it has some structure development, indicating a relatively stable soil rather

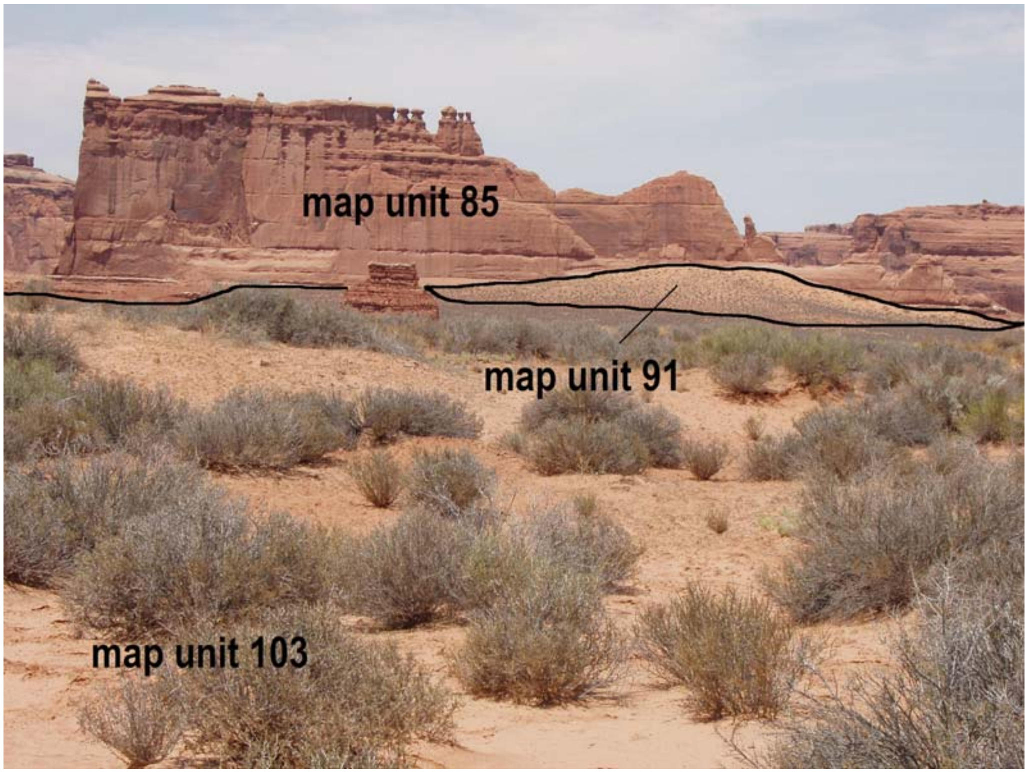

Figure 23.—Map unit 91, which includes a dune component, is shown here between map units 85 and 103.

Figure 24.—Landscape of the Mido soil in map unit 91 – Mido-Mido, strongly calcareous complex, 2 to 30 percent slopes. This is an example of a vegetated dune.

than the loose sand grains of a more active dune area. The Milok component is even more developed. Milok is coarse-loamy rather than sandy and has a significant zone of calcium carbonate accumulation and well-developed structure. The soils in these areas have benefited from stability in landscape position and, usually, more

vegetation, which has reduced soil movement. Cambic horizons are often present as well. They are characterized by the development of structure, color, and finer texture (loamy fine sand versus fine sandy loam, for example). An example of this is the Begay component in map unit 116.

Alluvial Soils

Another broad category of soil within the Park is alluvia. The character of these soils depends strongly on the source material of the alluvium (parent material) and the landscape position relative to intermittent water in drainageways (topography). The parent material determines the general texture of the soil – sandy versus silty or loamy – as well as other factors, such as salt content. Some alluvial material originated in the smaller watersheds within the park, whereas others were transported to the park through waterways that have their beginnings far outside the park. In map unit 110 (present in the larger Salt and Courthouse Washes) there are three major components. These range from the lowest soils on the alluvial landscape relative to the waterway (Bowington soils, moderately well drained, on flood-plain steps) to Radnik soils on high flood plain steps, and Patterfield soils, on higher stream terraces where flooding occurs only very rarely. The rest of the secondary drainages within the Park are dominated by the Livan family soils, which are only occasionally flooded. In general, the more stable the alluvial landscape that these soils reside on, the more development they may exhibit. There are several ecological sites found on alluvial soils in the Park, including Semiwet Fresh Streambank (Fremont Cottonwood) on frequently flooded low flood-plain steps, and Loamy Bottom (Basin Big Sagebrush) on occasionally-flooded high flood-plain steps. Alkali Flat (Greasewood) sites are often found on the higher stream terraces.

Residual and Colluvial Soils

Residual and colluvial soils occur throughout Arches National Park. Soils in the Park are often a combination of these two types, exhibiting a relatively thin layer of colluvium on top of a thicker layer of underlying residuum. In the Park, most of these residual or colluvial soils are shallow to bedrock. They are often overlain by a thin (less than 1 inch) cap of eolian sand. Residual and colluvial soils take on many of its qualities of the bedrock from which they weather. For example, the Crosscan family soil component of map unit 88 is very similar in its reddish color and loamy texture to its geology of origin, the Dewey Bridge Member of the Entrada Formation. In map unit 111, the clayey Hanksville soil develops as residuum from the clay-rich Mancos shale. The sandy Moclom soils in map unit 81 develop in colluvium and residuum weathered from the relatively sandy Salt Wash Sandstone Member of the Morrison Formation. The residual Retsabal soil component in map unit 106 exhibits the high levels of gypsum present in the original parent material (fig. 25). The ecological site associated with this high-gypsum soil is Semidesert Shallow Gypsum (Mormon Tea).

How This Survey Was Made

This survey was made in conjunction with the National Park Service's Inventory and Monitoring Program to provide information about the soils and miscellaneous areas in Arches National Park. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness and shape of the slopes; the general pattern of drainage; the kinds of native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface

Figure 25.—Profile of Retsabal soil in map unit 106. The light-colored gypsum is visible starting at 9 centimeters. Scale is in centimeters.

down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a

considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape. The approximate percentages of different soils or miscellaneous areas in the different map units was determined using the soil-landscape-landform models developed by extensive ground investigations coupled with remote-sensing tools, such as digital elevation models, detailed geology maps, aerial photography, and topographic maps.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately. Map unit composition (estimates of component percentages) was determined using a combination of transects on the ground, as well as photo interpretation based on ground-truthed data points.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage (fig. 26). Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a specific small area or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

Alluvial soils on flood-plain steps and terraces, and in drainageways

1—Bowington-Livan family-Radnik complex

Map Unit Setting

Landform setting: Flood-plain steps, terraces, and drainageways
Elevation: 3,960 to 4,830 feet (1,206 to 1,471 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Slope: 0 to 6 percent

Map Unit Composition

Extent of the complex in the survey area: 5 percent
Extent of the components in the complex:
 Bowington and similar soils: 37 percent
 Livan family and similar soils: 22 percent
 Radnik and similar soils: 19 percent

Soils of Minor Extent

Patterfield soils on terraces

Component Descriptions

Bowington soils
Position on the landform: Flood-plain steps

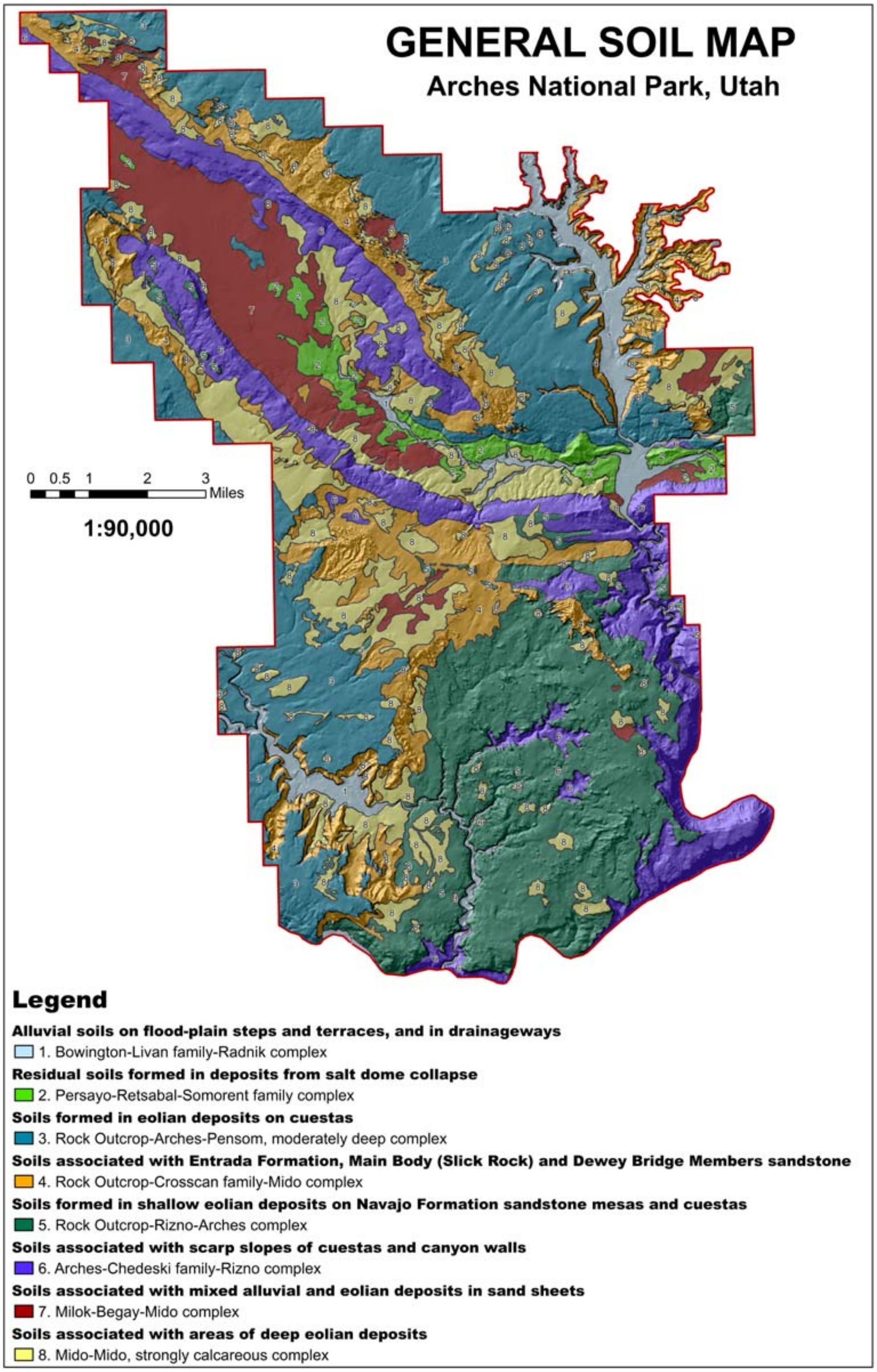

Figure 26.—General soil map of Arches National Park.

Parent material: Alluvium derived from sandstone
Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Rapid
Surface texture layer: Very fine sand

Livan family soils
Position on the landform: Low terraces and drainageways
Parent material: Alluvium derived from sandstone
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Surface texture layer: Fine sand

Radnik soils
Position on the landform: High flood-plain steps
Parent material: Alluvium derived from sandstone
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Moderately rapid
Surface texture layer: Fine sand

Residual soils formed in deposits from salt dome collapse

2—Persayo-Retsabal-Somorent family complex

Map Unit Setting

Landform setting: Hills and cuestas
Elevation: 4,270 to 5,020 feet (1,301 to 1,531 meters)
Mean annual precipitation: 7 to 11 inches (178 to 279 millimeters)
Slope: 2 to 70 percent

Map Unit Composition

Extent of the complex in the survey area: 3 percent
Extent of the components in the complex:
- Persayo and similar soils: 28 percent
- Retsabal and similar soils: 22 percent
- Somorent family and similar soils: 21 percent

Soils of Minor Extent

Hanksville soils on hills
Milok soils on hills

Component Descriptions

Persayo soils
Position on the landform: Hills and eroded scarp slopes of hills on cuestas
Parent material: Residuum weathered from shale
Depth class: Very shallow to shallow

Drainage class: Well drained
Permeability: Moderately slow to slow
Surface texture layer: Silt loam

Retsabal soils
Position on the landform: Hills
Parent material: Eolian deposits derived from sandstone over residuum weathered from rock gypsum
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Surface texture layer: Very fine sandy loam

Somorent family soils
Position on the landform: Dipslopes of cuestas
Parent material: Residuum weathered from sandstone
Depth class: Very shallow to shallow
Drainage class: Well drained
Permeability: Moderate
Surface texture layer: Gravelly fine sandy loam

Soils formed in eolian deposits on cuestas

3—Rock Outcrop-Arches-Pensom, moderately deep complex

Map Unit Setting

Landform setting: Cuestas
Elevation: 4,000 to 5,560 feet (1,219 to 1,696 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Slope: 2 to 45 percent

Map Unit Composition

Extent of the complex in the survey area: 19 percent
Extent of the components in the complex:
Rock outcrop: 43 percent
Arches and similar soils: 14 percent
Pensom, moderately deep and similar soils: 10 percent

Soils of Minor Extent

Nalcase soils on shrub-coppice dunes on cuestas
Romorris soils on hills on cuestas
Moclom soils on hills on dipslopes of cuestas
Simel soils on hills and talus slopes on cuestas

Component Descriptions

Rock Outcrop
Position on the landform: Dipslopes of cuestas
Parent material: Entrada Formation sandstone, Moab Tongue Member, and Morrison Formation sandstone, Salt Wash Member

Arches soils
Position on the landform: Sand sheets and shrub-coppice dunes on dipslopes of cuestas
Parent material: Eolian deposits derived from sandstone
Depth class: Very shallow to shallow
Drainage class: Excessively drained
Permeability: Rapid
Surface texture layer: Loamy fine sand

Pensom, moderately deep soils
Position on the landform: Dunes and shrub-coppice dunes on dipslopes of cuestas
Parent material: Eolian deposits derived from non-calcareous sandstone
Depth class: Moderately deep
Drainage class: Excessively drained
Permeability: Rapid
Surface texture layer: Fine sand

Soils associated with Entrada Formation, Main Body (Slick Rock) and Dewey Bridge Members sandstone

4—Rock Outcrop-Crosscan family-Mido complex

Map Unit Setting

Landform setting: Mesas and cuestas
Elevation: 4,120 to 5,660 feet (1,256 to 1,725 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Slope: 5 to 30 percent

Map Unit Composition

Extent of the complex in the survey area: 15 percent
Extent of the components in the complex:
Rock outcrop: 47 percent
Crosscan family and similar soils: 23 percent
Mido and similar soils: 10 percent

Soils of Minor Extent

Mident family soils on shrub-coppice dunes on cuestas

Component Descriptions

Rock Outcrop
Position on the landform: Mesas, dipslopes of cuestas, and canyon walls
Parent material: Entrada Formation Main Body (Slick Rock) and Dewey Bridge Members sandstone

Crosscan soils
Position on the landform: Hills and structural benches on dipslopes of cuestas
Parent material: Colluvium and residuum derived from sandstone
Depth class: Very shallow to shallow
Drainage class: Well drained
Permeability: Moderately rapid
Surface texture layer: Gravelly fine sandy loam

Mido soils
Position on the landform: Dunes and shrub-coppice dunes on mesas and cuestas
Parent material: Eolian deposits derived from sandstone
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Surface texture layer: Fine sand

Soils formed in shallow eolian deposits on Navajo formation sandstone mesas and cuestas

5—Rock Outcrop-Rizno-Arches complex

Map Unit Setting

Landform setting: Mesas and cuestas
Elevation: 3,960 to 5,520 feet (1,206 to 1,683 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Slope: 2 to 15 percent

Map Unit Composition

Extent of the complex in the survey area: 22 percent
Extent of the components in the complex:
- Rock outcrop: 36 percent
- Rizno and similar soils: 26 percent
- Arches and similar soils: 23 percent

Soils of Minor Extent

Mido soils on dunes on mesas and cuestas
Pocum family soils on mesas

Component Descriptions

Rock Outcrop
Position on the landform: Mesas and cuestas
Parent material: Navajo Formation sandstone

Rizno soils
Position on the landform: Mesas and cuestas
Parent material: Reworked eolian deposits derived from sandstone
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Surface texture layer: Very fine sand

Arches soils
Position on the landform: Dunes and shrub-coppice dunes on mesas and cuestas
Parent material: Eolian deposits derived from sandstone
Depth class: Very shallow to shallow
Drainage class: Excessively drained

Permeability: Rapid
Surface texture layer: Fine sand

Soils associated with scarp slopes of cuestas and canyon walls

6—Arches-Chedeski family-Rizno complex

Map Unit Setting

Landform setting: Mesas and cuestas
Elevation: 3,960 to 5,400 feet (1,206 to 1,647 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Slope: 2 to 60 percent

Map Unit Composition

Extent of the complex in the survey area: 15 percent
Extent of the components in the complex:
Arches and similar soils: 29 percent
Chedeski family and similar soils: 16 percent
Rizno and similar soils: 14 percent

Soils of Minor Extent

Rock outcrop (Wingate Formation sandstone)
Reef soils on scarp slopes of cuestas

Component Descriptions

Arches soils
Position on the landform: Hills and ledges on scarp slopes of cuestas
Parent material: Eolian deposits derived from sandstone
Depth class: Very shallow to shallow
Drainage class: Excessively drained
Permeability: Rapid
Surface texture layer: Fine sand

Chedeski family soils
Position on the landform: Scarp slopes of cuestas and canyon walls
Parent material: Colluvium derived from sandstone
Depth class: Shallow
Drainage class: Well drained
Permeability: Slow
Surface texture layer: Gravelly sandy clay loam

Rizno soils
Position on the landform: Narrow ledges on scarp slopes of cuestas
Parent material: Slope alluvium derived from sandstone
Depth class: Very shallow to shallow
Drainage class: Well drained
Permeability: Moderately rapid
Surface texture layer: Loamy sand

Soils associated with mixed alluvial and eolian deposits in sand sheets

7—Milok-Begay-Mido complex

Map Unit Setting

Landform setting: Sand sheets
Elevation: 4,270 to 5,370 feet (1,301 to 1,637 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Slope: 0 to 15 percent

Map Unit Composition

Extent of the complex in the survey area: 8 percent
Extent of the components in the complex:
Milok and similar soils: 53 percent
Begay and similar soils: 21 percent
Mido and similar soils: 19 percent

Soils of Minor Extent

Monue soils on fan remnants

Component Descriptions

Milok soils
Position on the landform: Sand sheets
Parent material: Slope alluvium and eolian deposits derived from sandstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface texture layer: Loamy fine sand

Begay soils
Position on the landform: Sand sheets
Parent material: Alluvium and eolian deposits derived from sandstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface texture layer: Fine sand

Mido soils
Position on the landform: Sand sheets and dunes
Parent material: Slope alluvium and eolian deposits derived from sandstone
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Surface texture layer: Loamy fine sand

Soils associated with areas of deep eolian deposits

8—Mido-Mido, strongly calcareous complex

Map Unit Setting

Landform setting: Dunes and sand sheets
Elevation: 4,100 to 5,510 feet (1,250 to 1,678 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Slope: 2 to 30 percent

Map Unit Composition

Extent of the complex in the survey area: 13 percent
Extent of the components in the complex:
Mido and similar soils: 59 percent
Mido, strongly calcareous and similar soils: 36 percent

Component Descriptions

Mido soils
Position on the landform: Dunes, climbing dunes, and shrub-coppice dunes
Parent material: Eolian deposits derived from sandstone
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Surface texture layer: Fine sand

Mido, strongly calcareous soils
Position on the landform: Sand sheets and interdunes
Parent material: Eolian deposits derived sandstone
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Surface texture layer: Fine sand

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Table 4 shows the taxonomic classification for each soil in the survey area.

Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

A soil series *family* has properties that are slightly outside the official series range

but is in the same taxonomic classification as the official series. An example is Pocum family, 2 to 8 percent slopes.

Taxadjuncts are soils that have properties outside the range of any recognized series, and are given the name of an established series that is most similar in characteristics. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named. The differences in properties are small so that major interpretations are not affected. An example is Hanksville-Persayo complex, 2 to 45 percent slopes. Hanksville is identified as a taxadjunct in table 4.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Monue gravelly loamy fine sand, 1 to 6 percent slopes, is a phase of the Monue series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Rock outcrop-Arches-Pensom family complex, 2 to 15 percent slopes, is an example.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Soil Descriptions

80—Remorris loam, 5 to 45 percent slopes

Map Unit Setting

General setting: Cuestas throughout Arches National Park
Elevation: 4,270 to 5,090 feet (1,300 to 1,550 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Remorris and similar soils: 85 percent
Minor components:
- Rock outcrop, Morrison Formation, Salt Wash Member (Sandstone)
- Rock outcrop, chert
- Moclom soils–Shallow Sand Rock Pocket (Utah Juniper/Pinyon)
- Simel soils–Semidesert Shallow Sandy Loam (Utah Juniper/Pinyon)
- Mido soils–Semidesert Sand (Blackbrush)

Soil Properties and Qualities

Remorris soils

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 27)
Landform: Hills on cuestas (fig. 28)
Geology: Morrison Formation, Tidwell Member (Jurrassic)
Parent material: residuum weathered from shale and siltstone
Slope: 5 to 45 percent, east to north aspects

Ground Cover:	(% Cover)
Cyanobacteria Crust:	5 to 10
Lichen Crust:	2 to 4
Moss Crust:	1 to 3
Salt Crust:	0
Gypsum Crust:	0
Litter <5mm:	3 to 6
Bare Soil:	15 to 25
Rock Fragments:	60 to 75
Plant Canopy:	10 to 20

Depth to restrictive feature(s): 4 to 20 inches to bedrock, paralithic
Drainage class: well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity total inches: about 0.6 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: medium
Hydrologic group: D
Calcium carbonate equivalent maximum: about 30 percent
Gypsum maximum: none
Salinity maximum: about 1 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 1 SAR (slightly sodic)
Ecological site name: Semidesert Shallow Sandy Loam (Blackbrush)
Ecological site number: R035XY233UT
Present vegetation (in most areas): blackbrush, shadscale saltbush, galleta, Torrey Mormon tea, Jones' pepperweed
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator):
618,357 meters E, 4284,403 meters N, zone 12.

C—0 to 4 inches (0 to 10 cm); reddish brown (5YR 4/4) loam, dark reddish brown (5YR 3/4), moist; 25 percent clay; massive; moderately hard, firm, moderately sticky and moderately plastic; few very fine roots throughout; common fine irregular pores; 10 percent channers; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

Cr1—4 to 6.5 inches (10 to 17 cm); common fine roots at top of horizon and few fine roots in cracks; soft Morrison Formation sandstone (Tidwell Member) bedrock; diffuse wavy boundary.

Figure 27.—Profile of Remorris soil in map unit 80. Bedrock is at 35 centimeters.

Figure 28.—Landscape of map unit 80 (Remorris loam, 5 to 45 percent slopes).

Cr2—6.5 to 60 inches (17 to 152 cm); few very fine and fine roots in cracks; soft Morrison Formation sandstone (Tidwell Member) bedrock.

Range in Characteristics

A horizon (where present)
- Hue: 2.5YR, 5YR
- Value: 4 or 5 dry, 3 moist
- Chroma: 6 or 8 dry, 4 or 6 moist
- Texture: very fine sandy loam, sandy loam
- Clay content: 12 to 18 percent
- Calcium carbonate equivalent: 15 to 30 percent
- Rock fragments: 5 to 15 percent gravel

C horizon
- Hue: 2.5YR, 5YR
- Value: 4 or 5 dry, 3 moist
- Chroma: 4 or 6, dry or moist
- Texture: loam, very fine sandy loam
- Clay content: 18 to 27 percent
- Calcium carbonate equivalent: 15 to 30 percent
- Rock fragments: 5 to 15 percent channers or gravel

81—Rock outcrop-Moclom-Simel complex, 2 to 30 percent slopes

Map Unit Setting

General setting: Cuestas throughout Arches National Park
Elevation: 4,300 to 5,450 feet (1,310 to 1,660 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Rock outcrop, Morrison Formation Sandstone, Salt Wash Member: 35 percent
Moclom and similar soils: 30 percent
Simel and similar soils: 25 percent
Minor components:
- Lithic Ustic Haplargids–Desert Shallow Loam (Shadscale)
- Remorris soils–Semidesert Shallow Sandy Loam (Blackbrush)

Soil Properties and Qualities

Rock outcrop, Morrison Formation Sandstone, Salt Wash Member

This component is characterized by gently sloping expanses of sandstone dissected by short, sometimes steep, escarpments at the edges of the rock strata. Vertical relief varies from a few to 20 or more feet. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain. Slopes generally range from 8 to 30 percent, but some steeper areas exist.

Moclom soils
Taxonomic classification: Mixed, mesic Lithic Torripsamments (fig. 29)
Landform: Hills on cuestas (fig. 30)
Geology: Morrison Formation, Salt Wash Member (Jurassic)
Parent material: colluvium derived from sandstone and/or residuum weathered from sandstone
Slope: 2 to 15 percent, south to north aspects

Ground Cover:	(% Cover)
Plant Canopy:	40-65
Litter <5mm:	3-6
Rock Fragments:	20-25
Bare Soil:	1-5
Cyanobacteria Crust:	1-5
Lichen Crust:	5-10
Moss Crust:	1-5
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 3 to 4 inches to bedrock, paralithic; 4 to 20 inches to bedrock, lithic
Drainage class: somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 0.2 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none

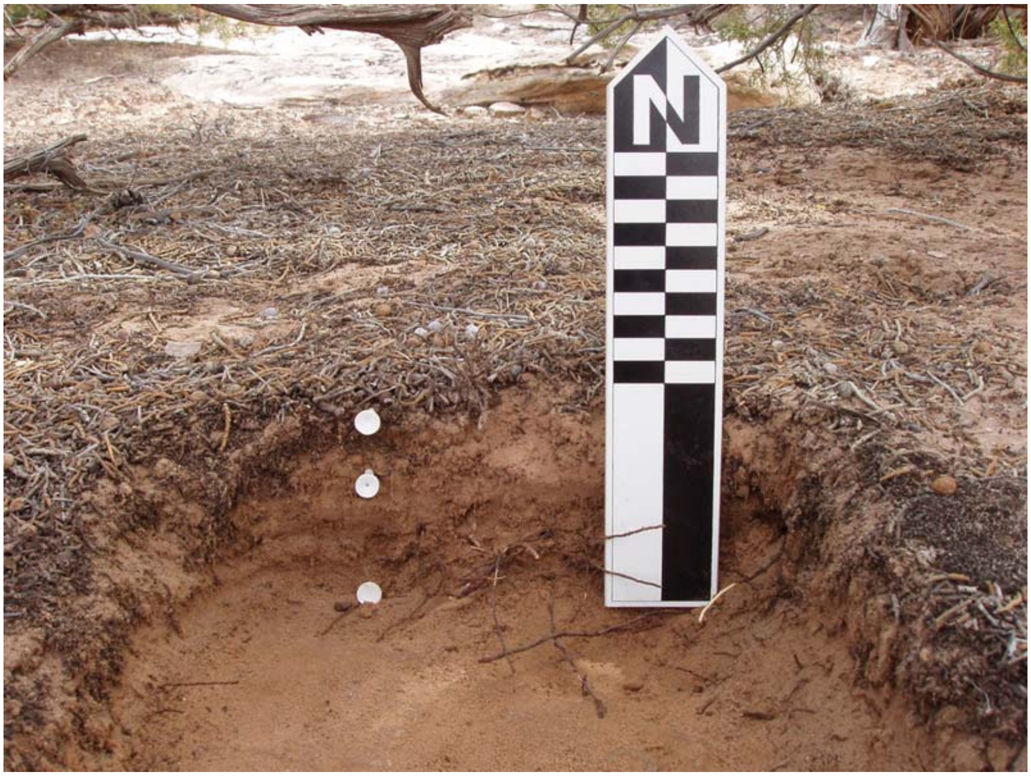

Figure 29.—Profile of Moclom soil in map unit 81. Lithic contact is at 10 centimeters. Small divisions on scale are centimeters.

Figure 30.—Landscape of the Moclom soil component in map unit 81 (Rock outcrop-Moclom-Simel complex, 2 to 30 percent slopes).

Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none
Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Pinyon)
Ecological site number: R035XY019UT
Present vegetation (in most areas): Bigelow sagebrush, Stansbury cliffrose, Utah juniper, Havard oak, Salina wildrye, littleleaf mountain-mahogany, twoneedle pinyon
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 627,919 meters E, 4288,781 meters N, zone 12.

C—0 to 3 inches (0 to 8 cm); brown (7.5YR 4/3) gravelly loamy sand, dark brown (7.5YR 3/3), moist; 8 percent clay; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots throughout; many very fine and few fine irregular pores; 20 percent gravel; slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.
Cr—3 to 4.5 inches (8 to 12 cm); many fine roots top of horizon; soft Morrison Formation (Salt Wash Member) sandstone bedrock; abrupt wavy boundary.
R—4.5 inches (12 cm); hard Morrison Formation (Salt Wash Member) sandstone bedrock.

Range in Characteristics

C horizon
Hue: 7.5YR, 10YR
Value: 4 or 5 dry, 3 or 4 moist
Chroma: 3 or 4 dry, 3 to 6 moist
Texture: loamy sand, sand (sands are dominantly medium and coarse in size)
Calcium carbonate equivalent: 1 to 5 percent
Clay content: 2 to 10 percent
Rock fragments: 5 to 30 percent gravel or channers

Some pedons also have a thin A horizon.

Simel soils

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 31)
Landform: Hills, cuestas, talus slopes (fig. 32)
Geology: Morrison Formation, Salt Wash Member (Jurassic)
Parent material: colluvium derived from sandstone and/or residuum weathered from limestone and shale
Slope: 2 to 30 percent, west to southwest aspects

Ground Cover:	(% Cover)
Plant Canopy:	20-35
Litter <5mm:	5-10
Rock Fragments:	40-60
Bare Soil:	5-10

Figure 31.—Profile of Simel soil in map unit 81. Paralithic contact is at 15 centimeters, and lithic contact is at 33 centimeters.

Figure 32.—Landscape of Simel soil component in map unit 81 (Rock outcrop-Moclom-Simel complex, 2 to 30 percent slopes).

Cyanobacteria Crust:	10-20
Lichen Crust:	5-10
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 20 inches to bedrock, paralithic; 10 to 20 inches to bedrock, lithic
Drainage class: well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity total inches: about 1.5 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: very high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 20 percent
Gypsum maximum: none
Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY236UT
Present vegetation (in most areas): Salina wildrye, Bigelow sagebrush, Indian ricegrass, Utah juniper, crispleaf buckwheat, galleta, green Mormon tea, blackbrush
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 60,563 meters E, 4296,544 meters N, zone 12.

A—0 to 1 inch (0 to 2 cm); reddish brown (5YR 5/4) channery sandy loam, reddish brown (5YR 4/4), moist; 18 percent clay; moderate thick platy structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots throughout; many very fine and common fine tubular pores; 25 percent channers and 5 percent flagstones; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk—1 inch to 3.5 inches (2 to 9 cm); reddish brown (5YR 5/4) channery sandy loam, reddish brown (5YR 4/4), moist; 19 percent clay; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots throughout; many very fine and common fine tubular pores; 15 percent channers and 5 percent flagstones; common medium irregular carbonate masses in matrix; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear wavy boundary.

2C—3.5 to 10 inches (9 to 25 cm); reddish brown (2.5YR 5/4) silty clay loam, reddish brown (2.5YR 4/4) and greenish gray (10GY 5/1), moist; 37 percent clay; massive; moderately hard, firm, moderately sticky and very plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; gradual smooth boundary.

2Cr—10 to 14 inches (25 to 36 cm); soft Morrison Formation (Salt Wash Member) limestone bedrock; common very fine and fine roots in cracks; abrupt smooth boundary.

2R—14 inches (36 cm); hard Morrison Formation (Salt Wash Member) limestone bedrock; few fine roots in cracks.

Range in Characteristics

A horizon
Hue: 2.5YR, 5YR
Texture: sandy loam, fine sandy loam
Clay content: 10 to 18 percent
Calcium carbonate equivalent: 10 to 15 percent
Rock fragments: 5 to 25 percent gravel, channers, and flagstones

Bk horizon (where present)
Clay content: 18 to 25 percent
Calcium carbonate equivalent: 10 to 20 percent
Rock fragments: 5 to 20 percent channers or flagstones

2C horizon
Value: 4 to 6 dry, 4 moist
Chroma: 3 to 6, dry or moist
Texture: silty clay loam, very fine sandy loam, silt loam
Clay content: 18 to 40 percent
Calcium carbonate equivalent: 5 to 15 percent
Rock fragments: 0 to 20 percent channers or gravel

2C horizon commonly has additional banded colors as well, inherited from the parent material.

83—Rock outcrop-Arches-Pensom, moderately deep complex, 2 to 15 percent slopes

Map Unit Setting

General setting: Cuestas throughout Arches National Park
Elevation: 4,190 to 5,560 feet (1,277 to 1,696 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Rock outcrop, Entrada Formation Sandstone, Moab Tongue Member: 55 percent
Arches and similar soils: 20 percent
Pensom family and similar soils: 20 percent
Minor components:
- Mido soils–Semidesert Sand (Dune)
- Rizno soils–Semidesert Shallow Sandy Loam (Utah Juniper/Blackbrush)

Soil Properties and Qualities

Rock outcrop, Entrada Formation Sandstone, Moab Tongue Member

This component is characterized by gently sloping expanses of sandstone dissected by short to moderate escarpments at the edges of the rock strata and along joints.

Vertical relief varies from a few feet to 20 or more feet. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain. Slopes generally range from 8 to 15 percent.

Arches soils

Taxonomic classification: Mixed, mesic Lithic Torripsamments (fig. 33)
Landform: Shrub-coppice dunes on cuestas (fig. 34)
Geology: Entrada Formation, Moab Tongue Member (Jurassic)
Parent material: eolian sands derived from non-calcareous sandstone
Slope: 2 to 15 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	35-65
Litter <5mm:	2-5
Rock Fragments:	0-10
Bare Soil:	5-10
Cyanobacteria Crust:	0-5
Lichen Crust:	20-30
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 20 inches to bedrock, lithic
Drainage class: somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 1.0 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none

Figure 33.—Profile of Arches soil in map unit 83. Lithic contact is at 12 centimeters. The small divisions on scale are centimeters.

Figure 34.—Landscape of map unit 83 (Rock outcrop-Arches-Pensom family complex, 2 to 15 percent slopes).

Seasonal water table minimum depth: greater than 60 inches
Runoff class: high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 1 percent
Gypsum maximum: none
Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Pinyon)
Ecological site number: R035XY019UT
Present vegetation (in most areas): Utah juniper, Bigelow sagebrush, Havard oak, Stansbury cliffrose, littleleaf mountain-mahogany, blackbrush, Indian ricegrass, broom snakeweed
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 62,019 meters E, 4282,393 meters N, zone 12.

A—0 to 0.5 inches (0 to 1 cm); light reddish brown (5YR 6/4) fine sand, reddish brown (5YR 4/3), moist; 5 percent clay; weak thick platy parting to weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine and fine tubular pores; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C1—0.5 to 3 inches (1 to 7 cm); light reddish brown (5YR 6/4) fine sand, reddish brown (5YR 4/4), moist; 3 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine and

fine tubular pores; noneffervescent; slightly alkaline, pH 7.8; gradual smooth boundary.

C2—3 to 14 inches (7 to 35 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 5/6), moist; 2 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine and common fine tubular pores; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C3—14 to 15.5 inches (35 to 39 cm); reddish brown (2.5YR 5/4) loamy fine sand, reddish brown (2.5YR 4/4), moist; 7 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine, fine, and medium roots throughout; common very fine and fine tubular pores; 5 percent channers; noneffervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

2R—15.5 inches (39 cm); hard Entrada Formation sandstone (Moab Tongue Member) bedrock.

Range in Characteristics

Surface (A or C) horizon

- Value: 6 or 7 dry, 3 to 5 moist
- Chroma: 4 dry, 3 or 4 moist
- Clay content: 0 to 5 percent
- Calcium carbonate equivalent: 0 to 1 percent
- Rock fragments: 0 to 1 percent channers
- Reaction: slightly alkaline or moderately alkaline (7.4 to 8.4)

C horizons

- Hue: 5YR, 2.5YR
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 4 or 6 dry, 3 to 6 moist
- Texture: fine sand, loamy fine sand
- Clay content: 0 to 7 percent
- Calcium carbonate equivalent: 0 to 1 percent
- Rock fragments: 0 to 5 percent channers
- Reaction: slightly alkaline or moderately alkaline (7.4 to 8.4)

Pensom family soils

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 35)
Landform: Dunes and shrub-coppice dunes on cuestas
Geology: Entrada Formation, Moab Tongue Member (Jurassic)
Parent material: eolian sands derived from non-calcareous sandstone
Slope: 2 to 15 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	35-65
Litter <5mm:	2-5
Rock Fragments:	0-10
Bare Soil:	5-10
Cyanobacteria Crust:	0-5
Lichen Crust:	20-30
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 20 to 39 inches to bedrock, lithic
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 1.7 (very low)
Shrink-swell potential: about 1.5 LEP (low)

Figure 35.—Profile of Pensom family soil in map unit 83. Scale is in centimeters.

Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches

Runoff class: medium
Hydrologic group: A
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none
Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Pinyon)
Ecological site number: R035XY019UT
Present vegetation (in most areas): Utah juniper, Bigelow sagebrush, Havard oak, Stansbury cliffrose, littleleaf mountain-mahogany, blackbrush, Indian ricegrass, broom snakeweed
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 618,132 meters E, 4284,662 meters N, zone 12.

A—0 to 5 inches (0 to 13 cm); reddish yellow (7.5YR 6/6) fine sand, brown (7.5YR 4/4), moist; 4 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots throughout; many very fine and common fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C1—5 to 11.5 inches (13 to 29 cm); pink (7.5YR 7/4) fine sand, brown (7.5YR 4/4), moist; 3 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine, and common fine and medium roots throughout; many very fine and fine, and common medium irregular pores; very slightly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

C2—11.5 to 27.5 inches (29 to 70 cm); reddish yellow (7.5YR 7/6) fine sand, strong brown (7.5YR 5/6), moist; 3 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; common coarse roots throughout; common very fine and fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

2R—27.5 inches (70 cm); hard Entrada Formation sandstone (Moab Tongue Member) bedrock.

Range in Characteristics

Surface (A or C) horizon
Hue: 5YR, 7.5YR
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 6 dry, 4 or 6 moist
Clay content: 0 to 5 percent
Calcium carbonate equivalent: 0 to 1 percent
Rock fragments: none
Reaction: slightly alkaline or moderately alkaline (7.4 to 8.4)

Subsurface C horizons
Hue: 5YR, 7.5YR
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Clay content: 0 to 5 percent
Calcium carbonate equivalent: 0 to 5 percent
Rock fragments: 0 to 5 percent gravel

85—Rock outcrop-Mident family-Mido complex, 15 to 30 percent slopes

Map Unit Setting

General setting: Mesas, cuestas, and canyon walls throughout Arches National Park
Elevation: 4,120 to 5,660 feet (1,256 to 1,725 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Rock outcrop, Entrada Formation Sandstone, Main Body Member: 60 percent
Mident family and similar soils: 15 percent
Mido and similar soils: 15 percent
Minor components:
- Rizno soils–Semidesert Shallow Sandy Loam (Utah Juniper/Blackbrush)

Soil Properties and Qualities

Rock outcrop, Entrada Formation Sandstone, Main Body Member

This component is characterized by complex rock formations; nearly level to gently sloping areas at the top of outcrops often drop off to very tall, nearly continuous, nearly vertical cliffs and escarpments. The vertical relief ranges from several tens to over one hundred feet. Some areas of this rock outcrop are smooth and undulating, and include potholes in which water may pond for brief periods after rain. Slopes generally range from 15 to 99 percent.

Mident family soils
Taxonomic classification: Mixed, mesic, shallow Ustic Torripsamments (fig. 36)
Landform: Shrub-coppice dunes on cuestas and mesas
Geology: Entrada Formation, Moab Tongue Member (Jurassic)
Parent material: eolian sands derived from sandstone
Slope: 15 to 30 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	40-65
Litter <5mm:	2-10
Rock Fragments:	5-10
Bare Soil:	0-10
Cyanobacteria Crust:	20-25
Lichen Crust:	10-15
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 10 inches to bedrock, paralithic; 10 to 20 inches to bedrock, lithic
Drainage class: somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 0.8 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none

Figure 36.—Profile of Mident family soil in map unit 85. Lithic contact is at 18 centimeters. Small divisions on scale are centimeters.

Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: very high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none
Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Pinyon)
Ecological site number: R035XY019UT
Present vegetation (in most areas): littleleaf mountain-mahogany, Stansbury cliffrose, Utah juniper, Havard oak, Utah serviceberry, singleleaf ash, twoneedle pinyon, green Mormon tea, needle and thread
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 620,530 meters E, 4294,952 meters N, zone 12.

C1—0 to 4.5 inches (0 to 11 cm); strong brown (7.5YR 5/6) fine sand, brown (7.5YR

4/4), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine interstitial pores; very slightly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

C2—4.5 to 9.5 inches (11 to 24 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine roots throughout; common very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

2Cr—9.5 to 14 inches (24 to 36 cm); soft Entrada Formation (Main Body Member) sandstone bedrock; abrupt smooth boundary.

2R—14 inches (36 cm); hard Entrada Formation (Main Body Member) sandstone bedrock.

Range in Characteristics

Mident family soils are redder in color than the official series, and have a lithic contact above 20 inches.

Surface (A or C) horizon
Hue: 5YR, 7.5YR
Clay content: 0 to 5 percent
Calcium carbonate equivalent: 0 to 5 percent
Rock fragments: none
Reaction: slightly alkaline or moderately alkaline (7.9 to 8.4)

Subsurface C horizons:
Clay content: 0 to 5 percent
Calcium carbonate equivalent: 0 to 5 percent
Rock fragments: none

Mido soils

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 37)
Landform: Dunes and shrub-coppice dunes on cuestas and mesas
Geology: Entrada Formation, Main Body Member (Jurassic)
Parent material: eolian sands derived from sandstone
Slope: 15 to 30 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	30-40
Litter <5mm:	10-15
Rock Fragments:	5-10
Bare Soil:	30-40
Cyanobacteria Crust:	15-20
Lichen Crust:	5-10
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 4.7 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: medium
Hydrologic group: A
Calcium carbonate equivalent maximum: about 8 percent

Figure 37.—Profile of Mido soil in map unit 85. Scale is in centimeters.

Gypsum maximum: none
Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 2 SAR (slightly sodic)
Ecological site name: Semidesert Sand (Dune)
Ecological site number: R035XY211UT
Present vegetation (in most areas): blackbrush, Havard oak, Utah juniper, broom snakeweed, green Mormon tea
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 613,849 meters E, 4294,081 meters N, zone 12.

A—0 to 4 inches (0 to 10 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 3 percent clay; weak very thick platy parting to weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.3; clear smooth boundary.

BC—4 to 33.5 inches (10 to 85 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; weak medium and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine, and common fine and medium roots throughout; many very fine irregular pores; slightly effervescent; strongly alkaline, pH 8.5; diffuse smooth boundary.

C—33.5 to 78.5 inches (85 to 200 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; common very fine, fine, and medium roots throughout; common very fine interstitial pores; strongly effervescent; strongly alkaline, pH 8.6; gradual smooth boundary.

Range in Characteristics

A horizon
Clay content: 0 to 5 percent
Calcium carbonate equivalent: 0 to 5 percent
Rock fragments: none

BC horizon
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6 dry, 6 moist
Texture: fine sand, loamy fine sand
Clay content: 0 to 12 percent
Calcium carbonate equivalent: 1 to 8 percent
Rock fragments: none
Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

C horizon
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 4 or 6 dry, 6 moist
Texture: fine sand, sand
Clay content: 0 to 5 percent
Calcium carbonate equivalent: 1 to 8 percent
Rock fragments: 0 to 10 percent gravel
Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

86—Arches-Rock outcrop complex, Entrada Formation, 2 to 15 percent slopes

Map Unit Setting

General setting: Cuestas throughout Arches National Park
Elevation: 4,000 to 5,420 feet (1,219 to 1,651 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Arches and similar soils: 50 percent
Rock outcrop, Entrada Formation Sandstone, Moab Tongue Member: 40 percent

Minor components:
- Rizno soils–Shallow Sand Rock Pocket (Utah Juniper/Pinyon)

Soil Properties and Qualities

Arches soils

Taxonomic classification: Mixed, mesic Lithic Torripsamments (fig. 38)
Landform: Sand sheets and shrub-coppice dunes on dipslopes of cuestas
Geology: Entrada Formation, Moab Tongue Member (Jurassic)
Parent material: eolian deposits derived from sandstone
Slope: 2 to 15 percent, northeast aspect

Ground Cover:	(% Cover)
Plant Canopy:	40-65
Litter <5mm:	2-10
Rock Fragments:	5-10
Bare Soil:	0-10
Cyanobacteria Crust:	20-25
Lichen Crust:	10-15
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 20 inches to bedrock, lithic
Drainage class: excessively drained

Figure 38.—Profile of Arches soil in map unit 86. Lithic contact is at 20 centimeters. Notice the roots visible directly on top of the hard bedrock. Small divisions on scale are centimeters.

Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 0.9 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none
Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Pinyon)
Ecological site number: R035XY019UT
Present vegetation (in most areas): Havard oak, Stansbury cliffrose, Utah juniper, Utah serviceberry, littleleaf mountain-mahogany, twoneedle pinyon, green Mormon tea, needle and thread, singleleaf ash
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 622,779 meters E, 4293,787 meters N, zone 12.

C1—0 to 1.5 inches (0 to 4 cm); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4), moist; 8 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine and few medium roots throughout; common very fine and many fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C2—1.5 to 10 inches (4 to 25 cm); light reddish brown (5YR 6/4) loamy fine sand, dark reddish brown (5YR 3/4), moist; 7 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots throughout; common very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.4; very abrupt smooth boundary.

2R—10 inches (25 cm); hard Entrada Formation (Moab Tongue) sandstone bedrock; common coarse roots at top of horizon.

Range in Characteristics

C horizon
Hue: 5YR, 7.5YR
Value: 5 or 6 dry, 3 or 4 moist
Chroma: 3 to 6, dry or moist
Clay content: 4 to 10 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: none

Rock outcrop, Entrada Formation Sandstone, Moab Tongue Member

This component is characterized by gently sloping expanses of sandstone dissected by short to moderate escarpments at the edges of the rock strata and along joints. Vertical relief varies from a few to 20 or more feet. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain. Slopes generally range from 8 to 30 percent.

87—Arches-Rock outcrop complex, 2 to 15 percent slopes

Map Unit Setting

General setting: Cuestas and hills throughout Arches National Park
Elevation: 4,320 to 5,310 feet (1,316 to 1,619 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Arches and similar soils: 50 percent
Rock outcrop, Navajo Formation Sandstone: 40 percent
Minor components:
- Shallow loamy soils–Semidesert Shallow Sandy Loam (Blackbrush)
- Mido soils–Semidesert Sand (Fourwing Saltbush)

Soil Properties and Qualities

Arches soils
Taxonomic classification: Mixed, mesic Lithic Torripsamments (fig. 39)
Landform: Hillslopes, cuestas, ledges (fig. 40)
Geology: Navajo Formation (Jurassic)
Parent material: eolian sands derived from sandstone
Slope: 2 to 15 percent, southwest to north aspects

Ground Cover:	(% Cover)
Plant Canopy:	30-40
Litter <5mm:	10-15
Rock Fragments:	5-10
Bare Soil:	30-40
Cyanobacteria Crust:	15-20
Lichen Crust:	5-10
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 14 inches to bedrock, lithic
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 0.9 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 4 percent
Gypsum maximum: none
Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 2 SAR (slightly sodic)

Figure 39.—Profile of Arches soil in map unit 87. Lithic contact is at 34 centimeters. Scale is in centimeters on left and inches on right.

Ecological site name: Semidesert Shallow Sandy Loam (Utah Juniper-Blackbrush)
Ecological site number: R035XY236UT
Present vegetation (in most areas): blackbrush, Utah juniper, green Mormon tea, broom snakeweed, twoneedle pinyon, Havard oak
Land capability (non irrigated): 7s

Figure 40.—Landscape of map unit 87 (Arches-Rock outcrop complex, 2 to 15 percent slopes).

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 626,460 meters E, 4284,450 meters N, zone 12.

A—0 to 4 inches (0 to 10 cm); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 4/4), moist; 3 percent clay; weak medium parting to weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C1—4 to 9 inches (10 to 23 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 3 percent clay; massive; loose, nonsticky and nonplastic; many very fine roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—9 to 13.5 inches (23 to 34 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; massive; loose, nonsticky and nonplastic; many very fine roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

2R—13.5 inches (34 cm); hard Navajo Formation sandstone bedrock.

Range in Characteristics

A horizon

Hue: 5YR, 7.5YR

Value: 5 or 6 dry, 4 to 7 moist

Calcium carbonate equivalent: 1 to 4 percent

Clay content: 1 to 5 percent
Rock fragments: none

C horizon
Hue: 5YR, 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 6 dry, 4 to 8 moist
Calcium carbonate equivalent: 1 to 5 percent
Clay content: 1 to 5 percent
Rock fragments: none
Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

Rock outcrop, Navajo Formation Sandstone

This component is characterized by gently sloping expanses of sandstone dissected by short, steep escarpments at the edges of the rock strata. Vertical relief varies from a few feet to 10 or more feet. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain. Slopes generally range from 8 to 45 percent.

88—Crosscan family-Rock outcrop complex, 5 to 30 percent slopes

Map Unit Setting

General setting: Throughout Arches National Park
Elevation: 4,120 to 5,310 feet (1,256 to 1,618 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Crosscan family and similar soils: 75 percent
Rock outcrop, Entrada Formation Sandstone, Dewey Bridge: 20 percent
Minor components:
- Rizno soils–Semidesert Shallow Sandy Loam (Blackbrush)
- Arches soils–Semidesert Shallow Sandy Loam (Utah Juniper/Blackbrush)
- Rock outcrop, Entrada Formation Sandstone, Main Body Member
- Mident family soils–Shallow Sand Rock Pocket (Utah Juniper/Pinyon)
- Mido soils–Semidesert Sand (Dune)

Soil Properties and Qualities

Crosscan family soils
Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 41)
Landform: Hillslopes, hills, structural benches (fig. 42)
Geology: Entrada Formation Sandstone, Dewey Bridge Member (Jurassic) with small areas of Chinle Formation (Triassic)
Parent material: colluvium derived from sandstone and/or residuum weathered from sandstone
Slope: 5 to 30 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	30-40
Litter <5mm:	10-15
Rock Fragments:	10-20
Bare Soil:	10-60
Cyanobacteria Crust:	10-15
Lichen Crust:	0-5
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

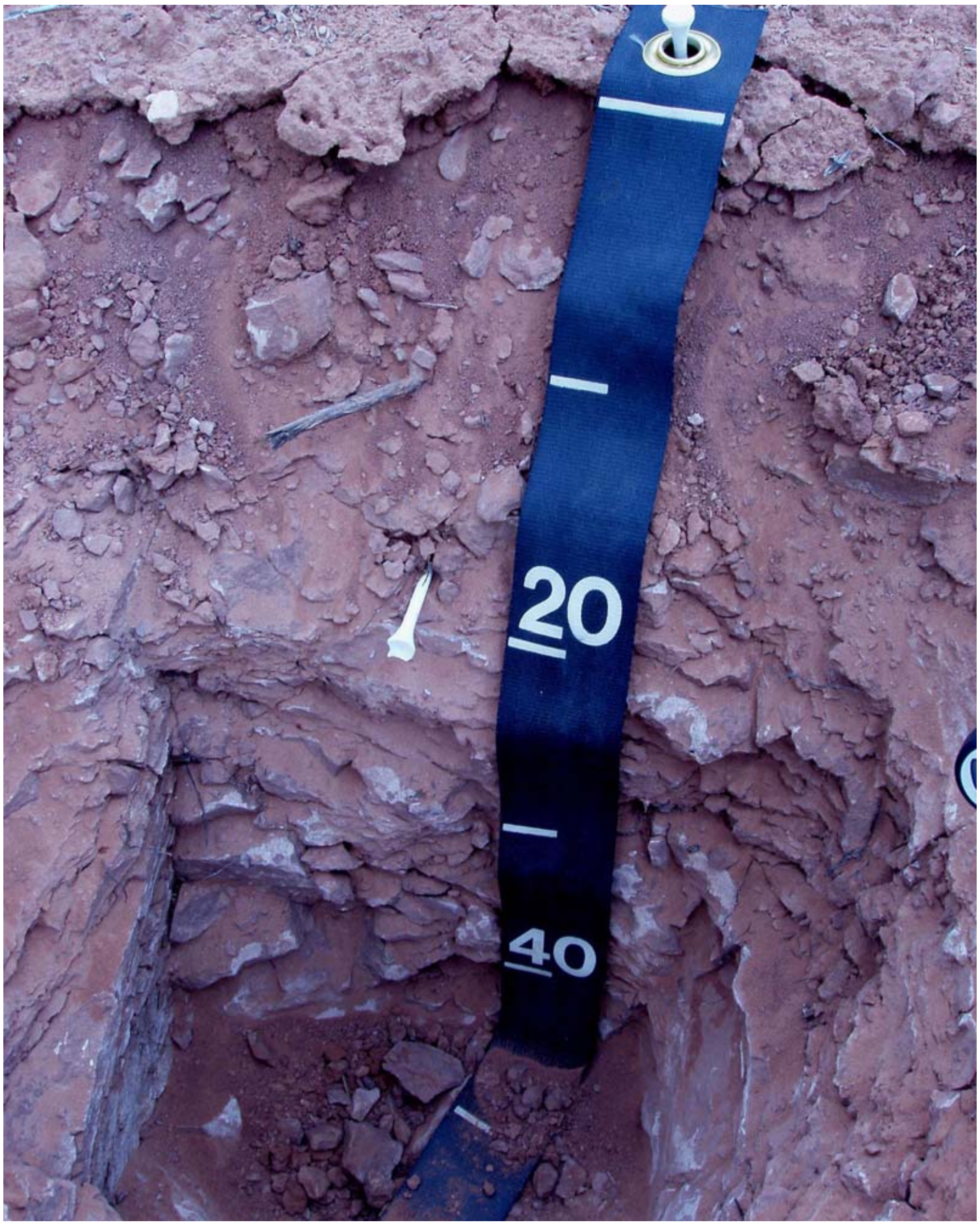

Figure 41.—Profile of Crosscan family soil in map unit 88. Paralithic contact is at 19 centimeters, and lithic contact is at 45 centimeters.

Figure 42.—Landscape of map unit 88 (Crosscan family-Rock outcrop complex, 5 to 30 percent slopes).

Depth to restrictive feature(s): 4 to 10 inches to bedrock, paralithic; 10 to 20 inches to bedrock, lithic
Drainage class: well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity total inches: about 0.5 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 30 percent
Gypsum maximum: none
Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 1 SAR (slightly sodic)
Ecological site name: Semidesert Shallow Sandy Loam (Utah Juniper-Blackbrush)
Ecological site number: R035XY236UT
Present vegetation (in most areas): blackbrush, Utah juniper, green Mormon tea, Havard oak, Stansbury cliffrose, twoneedle pinyon
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 623,639 meters E, 4283,647 meters N, zone 12.

A—0 to 2 inches (0 to 5 cm); light reddish brown (2.5YR 6/4) gravelly fine sandy loam, reddish brown (2.5YR 4/4), moist; 9 percent clay; moderate medium platy parting to moderate very fine granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and common fine roots throughout; many very fine irregular pores; 25 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C—2 to 4.5 inches (5 to 11 cm); red (2.5YR 4/6) very channery very fine sandy loam, dark red (2.5YR 3/6), moist; 12 percent clay; massive; soft, very friable, moderately sticky and nonplastic; common very fine and fine, and few medium roots throughout; many very fine irregular and common fine tubular pores; 50 percent channers; strongly effervescent; moderately alkaline, pH 8.2; diffuse wavy boundary.

Cr—4.5 to 13 inches (11 to 33 cm); soft Entrada Formation (Dewey Bridge Member) sandstone bedrock; common fine and medium roots in cracks; clear wavy boundary.

R—13 inches (33 cm); hard Entrada Formation (Dewey Bridge Member) sandstone bedrock.

Range in Characteristics

Crosscan family soils are warmer than the official series, and have less clay, a lithic contact, and redder hues..

A horizon (where present)
- Hue: 2.5YR, 5YR
- Value: 4 to 6 dry, 3 or 4 moist
- Chroma: 4 or 6, dry or moist
- Texture: fine sandy loam, loamy fine sand, silt loam
- Clay content: 5 to 18 percent
- Calcium carbonate equivalent: 5 to 20 percent
- Rock fragments: 5 to 35 percent gravel

C horizon:
- Hue: 2.5YR, 5YR
- Value: 4 to 6 dry, 3 or 4 moist
- Chroma: 6 dry, 4 or 6 moist
- Texture: very fine sandy loam, loam, fine sandy loam
- Clay content: 10 to 18 percent
- Calcium carbonate equivalent: 10 to 30 percent
- Rock fragments: 25 to 55 percent channers or gravel

Rock outcrop, Entrada Formation Sandstone, Dewey Bridge Member

This component is characterized by gently sloping expanses of sandstone dissected by short escarpments at the edges of the rock strata. Vertical relief is rarely more than a few feet. Slopes generally range from 8 to 30 percent.

89—Reef-Rock outcrop complex, 5 to 30 percent slopes

Map Unit Setting

General setting: Cuestas throughout Arches National Park
Elevation: 4,040 to 5,240 feet (1,232 to 1,596 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days

Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Reef and similar soils: 80 percent
Rock outcrop, Wingate Formation Sandstone: 15 percent
Minor components:
- Rizno soils–Semidesert Shallow Sandy Loam (Blackbrush

Soil Properties and Qualities

Reef soils
Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 43)
Landform: Hills on scarp slopes of cuestas (fig. 44)
Geology: Wingate Formation (Triassic)
Parent material: residuum weathered from sandstone
Slope: 5 to 30 percent, north to east aspects

Ground Cover:	(% Cover)
Plant Canopy:	20-35
Litter <5mm:	5-10
Rock Fragments:	35-50
Bare Soil:	2-6
Cyanobacteria Crust:	0-15
Lichen Crust:	0-10
Moss Crust:	0-5
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 20 inches to bedrock, lithic
Drainage class: somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity total inches: about 0.9 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 25 percent
Gypsum maximum: none
Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 2 SAR (slightly sodic)
Ecological site name: Semidesert Shallow Sandy Loam (Utah Juniper-Blackbrush)
Ecological site number: R035XY236UT
Present vegetation (in most areas): blackbrush, Utah juniper, green Mormon tea, singleleaf ash, spurge, twoneedle pinyon
Land capability (non irrigated): 7s

Typical Profile

Location
Geographic Coordinate System (Universal Transverse Mercator): 626,678 meters E, 4286,811 meters N, zone 12.

A—0 to 4.5 inches (0 to 11 cm); reddish yellow (5YR 6/6) very channery fine sandy loam, yellowish red (5YR 4/6), moist; 11 percent clay; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic;

Figure 43.—Profile of Reef soil in map unit 89. Lithic contact is at 15 centimeters. The small divisions on scale are centimeters.

many very fine and fine, and common medium roots throughout; 10 percent fine gravel, 20 percent channers, and 10 percent flagstones; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

C—4.5 to 9.5 inches (11 to 24 cm); yellowish red (5YR 5/6) extremely channery fine sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine, fine, and medium

roots throughout; 20 percent fine gravel, 30 percent channers, and 20 percent flagstones; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; clear wavy boundary.

R—9.5 inches (24 cm); hard Wingate Formation sandstone bedrock; common very coarse roots top of horizon;.

Range in Characteristics

A horizon (where present)
- Value: 4 to 6 dry, 4 moist
- Chroma: 6 dry, 4 or 6 moist
- Texture: fine sandy loam, sandy loam
- Clay content: 10 to 15 percent
- Calcium carbonate equivalent: 5 to 10 percent
- Rock fragments: 40 to 60 percent channers, flagstones, and gravel

C horizon
- Value: 4 or 5 dry, 3 or 4 moist
- Chroma: 4 or 6, dry or moist
- Texture: fine sandy loam, sandy loam, very fine sandy loam
- Clay content: 10 to 18 percent
- Calcium carbonate equivalent: 10 to 25 percent
- Rock fragments: 50 to 85 percent channers, flagstones, and gravel

Rock outcrop, Wingate Formation Sandstone

This component is characterized by strongly sloping to steep rock outcrop. The vertical relief is from a few feet to several feet, and the continuity of cliffs and shelves is broken. Slopes generally range from 5 to 99 percent.

Figure 44.—Landscape of map unit 89 (Reef-Rock outcrop complex, 5 to 30 percent slopes).

91—Mido-Mido, strongly calcareous complex, 2 to 30 percent slopes

Map Unit Setting

General setting: Areas of sand accumulation throughout Arches National Park
Elevation: 4,110 to 5,510 feet (1,254 to 1,678 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Mido and similar soils: 80 percent
Mido, strongly calcareous and similar soils: 15 percent
Minor components:
- Shallow soils–Semidesert Shallow Sandy Loam (Blackbrush) and Semidesert Shallow Sandy Loam (Utah Juniper/Blackbrush)
- Rock outcrop (Sandstone)

Soil Properties and Qualities

Mido soils
Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 45)
Landform: Climbing dunes, shrub-coppice dunes, dunes
Geology: Sand Deposits (Quaternary)
Parent material: eolian sands derived from sandstone
Slope: 5 to 30 percent, east to north aspects

Ground Cover:	(% Cover)
Plant Canopy:	20-30
Litter <5mm:	5-10
Rock Fragments:	0-3
Bare Soil:	45-60
Cyanobacteria Crust:	10-15
Lichen Crust:	0-5
Moss Crust:	0-5
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 4.0 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: medium
Hydrologic group: A
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none
Salinity maximum: about 0 mmhos/cm (nonsaline)

Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Semidesert Sand (Dune)
Ecological site number: R035XY211UT
Present vegetation (in most areas): rosemary mint, resin bush, Indian ricegrass, sand sagebrush
Land capability (non irrigated): 7s

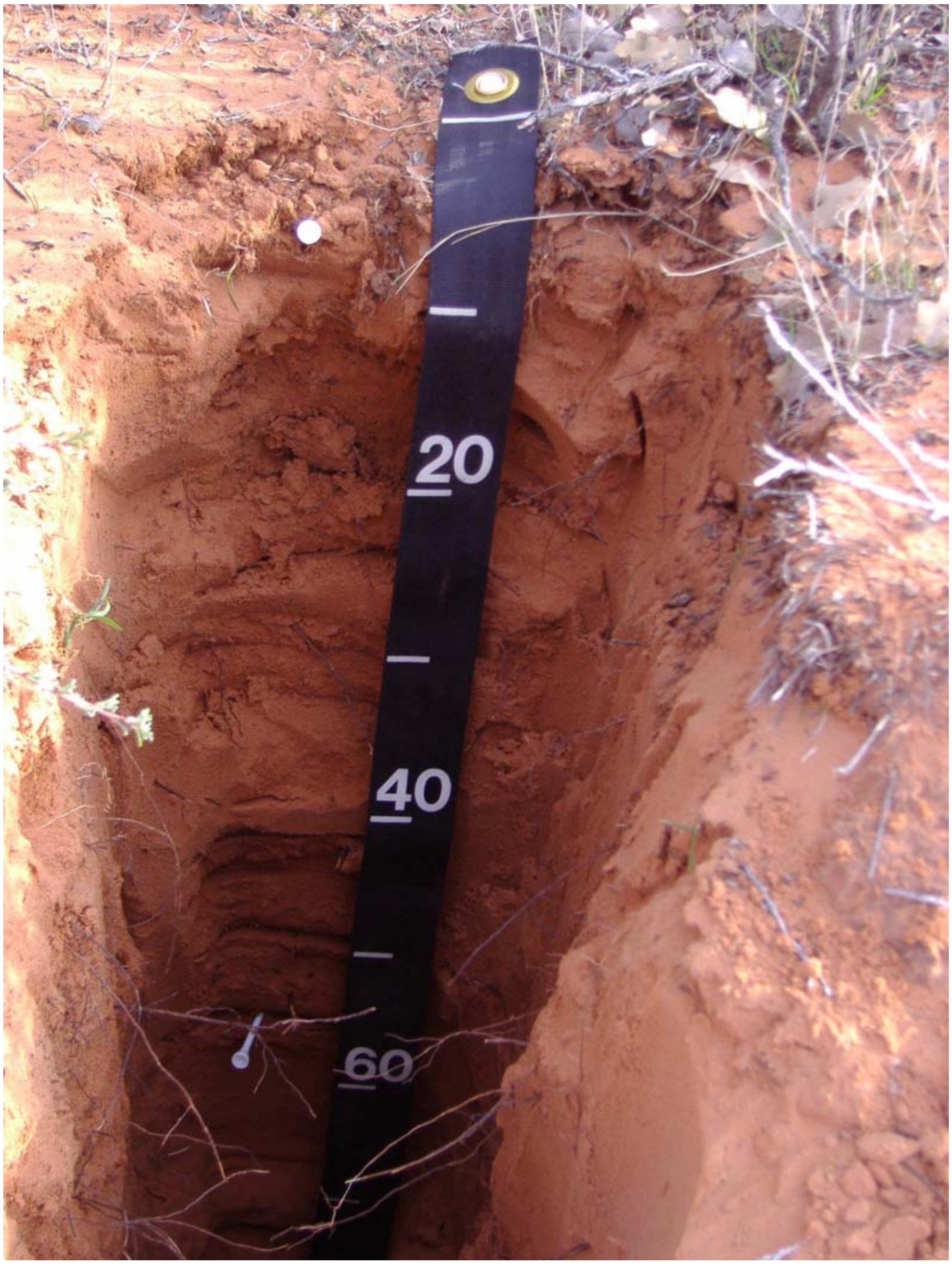

Figure 45.—Profile of Mido soil in map unit 91. Scale is in centimeters.

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 622,693 meters E, 4281,507 meters N, zone 12.

A—0 to 4.5 inches (0 to 11 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 1 percent clay; moderate thick platy structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine irregular pores; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C1—4.5 to 14 inches (11 to 35 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 1 percent clay; weak very thick platy structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots throughout; many very fine irregular pores; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C2—14 to 55 inches (35 to 140 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine interstitial pores; very slightly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

C3—55 to 78.5 inches (140 to 200 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; common very fine roots throughout; many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

A horizon
- Hue: 5YR, 7.5YR
- Value: 5 or 6, dry or moist
- Clay content: 1 to 5 percent
- Calcium carbonate equivalent: 0 to 5 percent
- Rock fragments: none
- Reaction: slightly alkaline or moderately alkaline (7.4 to 8.4)

C horizons
- Hue: 5YR, 7.5YR
- Value: 5 or 6 dry, 4 to 6 moist
- Texture: loamy fine sand, fine sand
- Clay content: 1 to 10 percent
- Calcium carbonate equivalent: 0 to 5 percent
- Rock fragments: none

Pedons that have hues of 7.5YR are similar soils.

Mido, strongly calcareous soils

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 46)
Landform: Interdunes, sand sheets (fig. 47)
Geology: Sand Deposits (Quaternary)
Parent material: eolian sands derived from sandstone
Slope: 2 to 15 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	30-40
Litter <5mm:	5-10
Rock Fragments:	0-3
Bare Soil:	2-8
Cyanobacteria Crust:	45-55

Figure 46.—Profile of Mido, strongly calcareous soil in map unit 91. Scale is in centimeters on left, inches on right.

Lichen Crust:	0-20
Moss Crust:	0-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 59 to 79 inches, lithic
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 3.6 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: low
Hydrologic group: A
Calcium carbonate equivalent maximum: about 10 percent
Gypsum maximum: none
Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 2 SAR (slightly sodic)
Ecological site name: Semidesert Sand (Blackbrush)
Ecological site number: R035XY210UT
Present vegetation (in most areas): blackbrush, Havard oak, Indian ricegrass, galleta, Utah juniper
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 622,319 meters E, 4276,807 meters N, zone 12.

A—0 to 5.5 inches (0 to 14 cm); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 4/4), moist; 3 percent clay; moderate fine subangular blocky and weak thin platy structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine irregular pores; very slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

Bw—5.5 to 24 inches (14 to 61 cm); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 4/4), moist; 3 percent clay; moderate coarse parting to moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine, and common fine and medium roots throughout; common very fine irregular pores; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk—24 to 55.5 inches (61 to 141 cm); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6), moist; 4 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine irregular pores; carbonate, finely disseminated throughout and common medium irregular carbonate masses in matrix; violently effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Figure 47.—Landscape of Mido, strongly calcareous component, map unit 91 (Mido-Mido, strongly calcareous complex, 2 to 30 percent slopes). Entrada Formation Sandstone, Main Body Member, component of map unit 85 in background.

BCk—55.5 to 60 inches (141 to 153 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 3 percent clay; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine irregular pores; carbonate, finely disseminated throughout and common fine irregular carbonate masses in matrix; violently effervescent, 9 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

2R—60 inches (153 cm); hard Navajo Formation sandstone bedrock.

Range in Characteristics

A horizon
- Value: 4 to 6 dry, 4 moist
- Chroma: 4 or 6 dry, 3 or 4 moist
- Texture: loamy fine sand, fine sand
- Clay content: 1 to 5 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Rock fragments: none

Bw horizon (where present)
- Value: 5 or 6 dry, 4 to 6 moist
- Chroma: 3 to 6 dry, 4 or 5 moist
- Clay content: 1 to 5 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Rock fragments: none

Bk or BCk horizon
- Hue: 2.5YR or 5YR
- Value: 5 to 7 dry, 4 moist
- Texture: loamy fine sand, fine sand, sand
- Clay content: 1 to 10 percent
- Calcium carbonate equivalent: 5 to 10 percent
- Rock fragments: 0 to 10 percent gravel
- Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

In some pedons hard bedrock is present below 60 inches (153 centimeters). Some pedons also have a very thin rind of soft bedrock overlying the hard bedrock. Secondary calcium carbonate is present but in insufficient quantities to qualify as a calcic horizon.

100—Arches-Rizno-Rock outcrop complex, 2 to 15 percent slopes

Map Unit Setting

General setting: Cuestas, mesas, and hills throughout Arches National Park
Elevation: 3,960 to 5,400 feet (1,206 to 1,647 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Arches and similar soils: 35 percent

Rock outcrop, Kayenta Formation Sandstone: 30 percent
Rizno and similar soils: 30 percent
Minor components:
- Loamy soils deeper than 20 inches–Semidesert Sandy Loam (Blackbrush)

Soil Properties and Qualities

Arches soils

Taxonomic classification: Mixed, mesic Lithic Torripsamments (fig. 48)
Landform: Hillslopes and ledges on cuestas and mesas (fig. 49)
Geology: Kayenta Formation (Triassic)
Parent material: eolian sands
Slope: 2 to 15 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	40-65
Litter <5mm:	2-10
Rock Fragments:	5-10
Bare Soil:	0-10
Cyanobacteria Crust:	20-25
Lichen Crust:	10-15
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 10 inches to bedrock, lithic
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)

Figure 48.—Profile of Arches soil in map unit 100. Lithic contact is at 12 centimeters. The small divisions on scale are centimeters.

Figure 49.—Landscape of map unit 100 (Arches-Rizno-Rock outcrop complex, 2 to 15 percent slopes).

Available water capacity total inches: about 0.3 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none
Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Pinyon)
Ecological site number: R035XY019UT
Present vegetation (in most areas): Utah juniper, Bigelow sagebrush, Jones' pepperweed, singleleaf ash, sumac, Brickellia, Stansbury cliffrose, purple threeawn, green Mormon tea, twoneedle pinyon
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 617,023 meters E, 4296,021 meters N, zone 12.

A—0 to 1.5 inches (0 to 4 cm); brown (7.5YR 5/4) fine sand, brown (7.5YR 4/3), moist; 5 percent clay; weak medium and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots throughout; many

very fine irregular pores; 1 percent fine gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C—1.5 to 4.5 inches (4 to 11 cm); light brown (7.5YR 6/4) fine sand, brown (7.5YR 4/4), moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; many very fine roots throughout; many very fine interstitial pores; strongly effervescent; moderately alkaline, pH 8.4; very abrupt wavy boundary.

2R—4.5 inches (11 cm); hard Kayenta Formation sandstone bedrock.

Range in Characteristics

A horizon (where present)
Calcium carbonate equivalent: 1 to 4 percent
Clay content: 1 to 5 percent
Rock fragments: 0 to 5 percent gravel

C horizon
Hue: 5YR, 7.5YR
Value: 4 or 6 dry, 3 or 4 moist
Texture: fine sand, loamy fine sand
Calcium carbonate equivalent: 1 to 5 percent
Clay content: 1 to 10 percent
Rock fragments: 0 to 5 percent gravel

Rizno soils

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 50)
Landform: Hillslopes and ledges on cuestas and mesas
Geology: Kayenta Formation (Triassic)
Parent material: slope alluvium derived from sandstone
Slope: 2 to 15 percent, south to northwest aspects

Ground Cover:	(% Cover)
Plant Canopy:	40-65
Litter <5mm:	2-10
Rock Fragments:	5-10
Bare Soil:	0-10
Cyanobacteria Crust:	20-25
Lichen Crust:	10-15
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 10 inches to bedrock, lithic
Drainage class: well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity total inches: about 0.7 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none

Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Pinyon)
Ecological site number: R035XY019UT

Figure 50.—Profile of Rizno soil in map unit 100. Lithic contact is at 20 centimeters. Small divisions on scale are centimeters.

Present vegetation (in most areas): Utah juniper, rock goldenrod, twoneedle pinyon, Jones' pepperweed, Bigelow sagebrush, Brickellia, green Mormon tea, Stansbury cliffrose, singleleaf ash, yellow rabbitbrush
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 614,408 meters E, 4297,509 meters N, zone 12.

A—0 to 1 inch (0 to 2 cm); light reddish brown (5YR 6/4) loamy sand, reddish brown (5YR 4/4), moist; 7 percent clay; thin platy parting to weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine and common fine irregular pores; 10 percent channers; strongly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.
C1—1 to 2 inches (2 to 5 cm); light reddish brown (5YR 6/4) channery sandy loam, reddish brown (5YR 4/4), moist; 10 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots throughout; many very fine and common fine irregular pores; 20 percent channers; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.
C2—2 to 6 inches (5 to 15 cm); reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4), moist; 10 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; many very fine and common fine roots throughout; many very fine and common fine irregular pores; 3 percent channers; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.
R—6 inches (15 cm); hard Kayenta Formation sandstone bedrock.

Range in Characteristics

A horizon
Hue: 5YR, 7.5YR
Texture: loamy sand, fine sand
Clay content: 5 to 10 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: 0 to 10 percent channers

C horizon
Hue: 2.5YR, 5YR
Value: 4 to 6 dry, 3 or 4 moist
Chroma: 4 or 6, dry or moist
Texture: sandy loam, fine sandy loam
Clay content: 8 to 15 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: 0 to 20 percent channers

Rock outcrop, Kayenta Formation Sandstone

This component is characterized by gently sloping expanses of sandstone dissected by short, steep escarpments at the edges of the rock strata. Vertical relief varies from a few feet to 10 or more feet. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain. Slopes generally range from 8 to 45 percent.

103—Mido, strongly calcareous-Mido complex, 2 to 15 percent slopes

Map Unit Setting

General setting: Sand sheets throughout Arches National Park
Elevation: 4,100 to 5,410 feet (1,250 to 1,650 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Mido, strongly calcareous and similar soils: 65 percent
Mido and similar soils: 30 percent
Minor components:
- Mivida soils–Semidesert Sandy Loam (Blackbrush)
- Sandy soils on active dunes–Semidesert Sand (Dune)
- Rizno soils–Semidesert Shallow Sandy Loam (Utah Juniper/Blackbrush)
- Milok soils–Semidesert Sandy Loam (Fourwing Saltbush)
- Rock outcrop (Sandstone)

Soil Properties and Qualities

Mido, strongly calcareous soils
Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 51)
Landform: Interdunes, sand sheets (fig. 52)
Geology: Eolian and Alluvial Deposits (Quaternary)
Parent material: eolian sands derived from sandstone
Slope: 2 to 8 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	40-50
Litter <5mm:	5-10
Rock Fragments:	0-3
Bare Soil:	5-20
Cyanobacteria Crust:	30-50
Lichen Crust:	10-15
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 5.5 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: low
Hydrologic group: A

Figure 51.—Profile of Mido, strongly calcareous soil in map unit 103. Scale is in centimeters.

Calcium carbonate equivalent maximum: about 8 percent
Gypsum maximum: none
Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 2 SAR (slightly sodic)
Ecological site name: Semidesert Sand (Blackbrush)
Ecological site number: R035XY210UT
Present vegetation (in most areas): blackbrush, sand sagebrush, Cutler Mormon tea, Torrey's jointfir, galleta, plains pricklypear
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 622,134 meters E, 4277,813 meters N, zone 12.

A—0 to 2 inches (0 to 5 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 4 percent clay; weak medium platy and weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine irregular pores; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bw—2 to 18.5 inches (5 to 47 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 1 percent clay; moderate coarse and fine roots throughout; many very fine irregular pores; very slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bk—18.5 to 35.5 inches (47 to 90 cm); yellowish red (5YR 4/6) fine sand, reddish brown (5YR 4/4), moist; 2 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; common very fine irregular pores; carbonate, finely disseminated throughout and few carbonate nodules in matrix; strongly

Figure 52.—Landscape of map unit 103 (Mido, strongly calcareous-Mido complex, 2 to 15 percent slopes). Mido, strongly calcareous soil component (with Blackbrush), and Mido component (with sand sage) are visible.

effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

C1—35.5 to 67.5 inches (90 to 172 cm); yellowish red (5YR 4/6) loamy fine sand, reddish brown (5YR 4/4), moist; 5 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; common very fine irregular pores; carbonate, finely disseminated throughout; violently effervescent, 6 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; clear smooth boundary.

C2—67.5 to 76 inches (172 to 193 cm); yellowish red (5YR 4/6) fine sand, reddish brown (5YR 4/4), moist; 1 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; common very fine irregular pores; carbonate, finely disseminated throughout; violently effervescent, 6 percent calcium carbonate equivalent; strongly alkaline, pH 8.6.

Range in Characteristics

A horizon
- Value: 4 to 6 dry, 4 moist
- Chroma: 6 dry, 4 or 6 moist
- Texture: fine sand, loamy fine sand
- Clay content: 1 to 8 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Rock fragments: 0 to 5 percent gravel

Bw horizon
- Value: 4 or 5 dry, 4 moist
- Chroma: 6 dry, 4 or 6 moist
- Texture: fine sand, loamy fine sand
- Clay content: 1 to 8 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Rock fragments: 0 to 5 percent gravel

Bk and C horizons
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 4 or 6, dry or moist
- Texture: fine sand, loamy fine sand
- Clay content: 1 to 8 percent
- Calcium carbonate equivalent: 5 to 8 percent
- Rock fragments: 0 to 5 percent gravel
- Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

Secondary calcium carbonate is present but in insufficient quantities to qualify as a calcic horizon.

Mido soils

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 53)
Landform: Shrub-coppice dunes on sand sheets
Geology: Eolian and Alluvial Deposits (Quaternary)
Parent material: eolian sands derived from sandstone
Slope: 2 to 15 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	30-40
Litter <5mm:	10-15
Rock Fragments:	0-3
Bare Soil:	10-20

Cyanobacteria Crust:	20-30
Lichen Crust:	15-20
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)

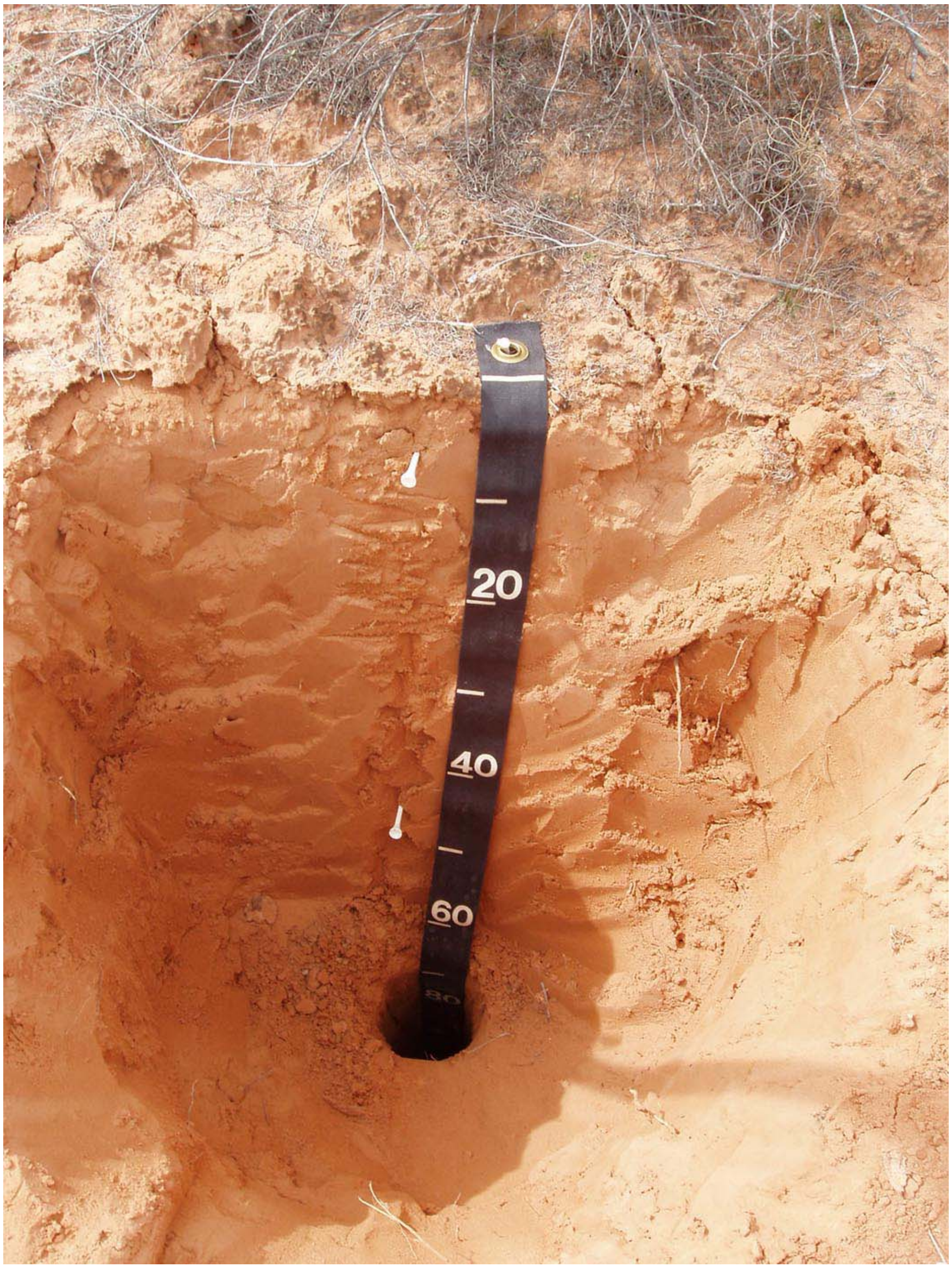

Figure 53.—Profile of Mido soil in map unit 103. Scale is in centimeters.

Available water capacity total inches: about 5.9 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: low
Hydrologic group: A
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none
Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 2 SAR (slightly sodic)
Ecological site name: Semidesert Sand (Blackbrush)
Ecological site number: R035XY210UT
Present vegetation (in most areas): sand sagebrush, blackbrush, Cutler Mormon tea, Indian ricegrass
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 623,984 meters E, 4291,268 meters N, zone 12.

A—0 to 1 inch (0 to 2 cm); reddish yellow (5YR 7/6) fine sand, yellowish red (5YR 5/8), moist; 2 percent clay; moderate medium platy parting to weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; many very fine and common fine roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C1—1 inch to 14.5 inches (2 to 37 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 4/6), moist; 3 percent clay; massive; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots throughout; common very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C2—14.5 to 78.5 inches (37 to 200 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/8), moist; 6 percent clay; single grain; loose, slightly sticky and nonplastic; common very fine, fine, and medium roots throughout; common very fine and fine interstitial pores; slightly effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

A horizon
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 6 dry, 6 or 8 moist
Clay content: 1 to 5 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: none

C horizon
Value: 5 to 7 dry, 4 to 7 moist
Chroma: 4 to 8, dry or moist
Texture: fine sand, loamy fine sand
Clay content: 1 to 8 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: none
Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

106—Retsabal very fine sandy loam, 2 to 15 percent slopes

Map Unit Setting

General setting: Hills in Salt Valley, Arches National Park
Elevation: 4,590 to 4,920 feet (1,400 to 1,500 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Retsabal and similar soils: 85 percent
Minor components:
- Rock outcrop–Paradox Formation (Alabaster Gypsum)
- Soils deeper than 20 inches–Semidesert Gypsum (Torrey Mormon Tea)

Soil Properties and Qualities

Retsabal soils
Taxonomic classification: Loamy, gypsic, mesic, shallow Ustic Torriorthents
Landform: Hills, hillslopes (fig. 54)
Geology: Paradox Formation (Pennsylvanian)
Parent material: eolian deposits derived from sandstone and/or residuum weathered from rock gypsum
Slope: 2 to 15 percent, north aspect

Figure 54.—Landscape of map unit 106 (Retsabal very fine sandy loam, 2 to 15 percent slopes).

Ground Cover:	(% Cover)
Plant Canopy:	20-45
Litter <5mm:	3-8
Rock Fragments:	3-8
Bare Soil:	5-10
Cyanobacteria Crust:	10-15
Lichen Crust:	40-50
Moss Crust:	0-5
Salt Crust:	0
Gypsum Crust:	5-10

Depth to restrictive feature(s): 4 to 20 inches to bedrock, paralithic
Drainage class: well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity total inches: about 1.7 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: medium
Hydrologic group: D
Calcium carbonate equivalent maximum: about 20 percent
Gypsum maximum: about 100 percent
Salinity maximum: about 5 mmhos/cm (slightly saline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Gypsum (Mormon tea)
Ecological site number: R035XY237UT
Present vegetation (in most areas): Torrey Mormon tea, fourwing saltbush, desert princes plume, Jones' pepperweed, galleta
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 619,863 meters E, 4290,763 meters N, zone 12.

A—0 to 2 inches (0 to 5 cm); brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4), moist; 13 percent clay; weak fine subangular blocky and moderate very thick platy structure; slightly hard, friable, slightly sticky and nonplastic; many very fine and common fine roots throughout; many very fine and common fine vesicular pores; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Cy—2 to 6.5 inches (5 to 17 cm); reddish brown (5YR 5/4) very fine sandy loam, yellowish red (5YR 4/6), moist; 14 percent clay; moderate very thick platy structure; slightly hard, friable, slightly sticky and nonplastic; many very fine, and common fine and medium roots throughout; many very fine and common fine vesicular, and common medium tubular pores; common fine irregular gypsum masses in matrix; strongly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

2Cy—6.5 to 12.5 inches (17 to 32 cm); very pale brown (10YR 8/3) sandy loam, light brownish gray (10YR 6/2), moist; 8 percent clay; massive; soft, friable, nonsticky and nonplastic; common fine, medium, and coarse roots throughout; many very fine irregular pores; many fine irregular gypsum crystals in matrix; slightly effervescent; slightly alkaline, pH 7.6; gradual wavy boundary.

2Cr1—12.5 to 21.5 inches (32 to 54 cm); soft alabaster gypsum (Paradox Formation) bedrock; few fine, medium, and coarse roots in cracks; clear smooth boundary.
2Cr2—21.5 to 25.5 inches (54 to 65 cm); soft alabaster gypsum (Paradox Formation) bedrock.

Range in Characteristics

A horizon
Hue: 5YR, 7.5YR
Value: 5 to 7 dry, 4 to 6 moist
Chroma: 4 or 6, dry or moist
Texture: very fine sandy loam, loam
Clay content: 10 to 18 percent
Calcium carbonate equivalent: 5 to 15 percent
Gypsum content: 0 to 5 percent
Rock fragments: none

Cy horizon
Clay content: 10 to 15 percent
Calcium carbonate equivalent: 5 to 20 percent
Gypsum content: 5 to 15 percent
Rock fragments: none

2Cy horizon
Hue: 10YR, 2.5Y
Value: 7 or 8 dry, 6 to 8 moist
Chroma: 3 or 4 dry, 2 to 4 moist
Texture: sandy loam, loamy sand
Clay content: 5 to 15 percent
Calcium carbonate equivalent: 5 to 15 percent
Gypsum content: 15 to 70 percent
Rock fragments: 0 to 5 percent gypsum rock gravel
Reaction: neutral or slightly alkaline (6.6 to 7.8)

108—Milok-Mido, strongly calcareous complex, 2 to 15 percent slopes

Map Unit Setting

General setting: Salt Valley, Eagle Park, and Winter Camp regions of Arches National Park
Elevation: 4,570 to 5,360 feet (1,394 to 1,633 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Milok and similar soils: 70 percent
Mido, strongly calcareous and similar soils: 25 percent
Minor components:
• Begay soils–Semidesert Sandy Loam (Fourwing Saltbush)

Soil Properties and Qualities

Milok soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids (fig. 55)
Landform: Sand sheets (fig. 56)
Geology: Eolian and Alluvial Deposits (Quaternary)
Parent material: slope alluvium derived from sandstone and/or eolian sands derived from sandstone
Slope: 2 to 6 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	40-50
Litter <5mm:	10-15
Rock Fragments:	0
Bare Soil:	0-5

Figure 55.—Profile of Milok soil in map unit 108. Scale is in centimeters.

Figure 56.—Landscape of map unit 108 (Milok-Mido, strongly calcareous complex, 2 to 15 percent slopes).

Cyanobacteria Crust:	45-55
Lichen Crust:	5-10
Moss Crust:	0-5
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity total inches: about 7.4 (high)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: very low
Hydrologic group: A
Calcium carbonate equivalent maximum: about 15 percent
Gypsum maximum: none
Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 2 SAR (slightly sodic)
Ecological site name: Semidesert Sandy Loam (Fourwing Saltbush)
Ecological site number: R035XY215UT
Present vegetation (in most areas): Indian ricegrass, galleta, fourwing saltbush, cheatgrass, blackbrush
Land capability (non irrigated): 6s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 614,653 meters E, 4298,723 meters N, zone 12.

A—0 to 4 inches (0 to 10 cm); yellowish red (5YR 4/6) loamy fine sand, reddish brown (5YR 4/3), moist; 6 percent clay; weak thick platy parting to weak medium granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bk1—4 to 18 inches (10 to 46 cm); yellowish red (5YR 5/6) loamy very fine sand, yellowish red (5YR 4/6), moist; 7 percent clay; moderate very coarse prismatic parting to moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; many very fine and common fine roots throughout; many very fine irregular pores; common medium irregular carbonate masses in matrix; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bk2—18 to 36.5 inches (46 to 93 cm); yellowish red (5YR 5/6) loamy very fine sand, yellowish red (5YR 4/6), moist; 8 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots throughout; common very fine irregular pores; carbonate, finely disseminated throughout and common fine irregular carbonate masses in matrix; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bk3—36.5 to 52.5 inches (93 to 133 cm); pink (5YR 7/4) very fine sandy loam, yellowish red (5YR 5/6), moist; 15 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots throughout; common very fine irregular pores; carbonate, finely disseminated throughout and many distinct carbonate coatings on all faces of peds; 5 percent gravel; violently effervescent; strongly alkaline, pH 8.6; gradual wavy boundary.

CBk—52.5 to 64 inches (133 to 163 cm); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6), moist; 6 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots throughout; common very fine irregular pores; carbonate, finely disseminated throughout and common fine carbonate masses in matrix; violently effervescent; strongly alkaline, pH 8.6; gradual wavy boundary.

C—64 to 73 inches (163 to 186 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common very fine roots throughout; common very fine interstitial pores; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon

Hue: 5YR, 7.5YR
Value: 4 to 6 dry, 4 moist
Chroma: 4 or 6 dry, 3 to 6 moist
Texture: loamy fine sand, very fine sandy loam, fine sandy loam
Clay content: 5 to 10 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: 0 to 5 percent gravel

Upper Bk or Bw horizon

Value: 4 or 5 dry, 4 moist
Clay content: 8 to 15 percent

Calcium carbonate equivalent: 1 to 5 percent (calcium carbonate accumulations less than 5 percent fine and medium masses)
Rock fragments: 0 to 5 percent gravel

Lower Bk horizons
Value: 4 to 7 dry, 4 or 5 moist
Chroma: 4 or 6 dry, 6 moist
Texture: loamy very fine sand, very fine sandy loam, fine sandy loam
Clay content: 7 to 18 percent
Calcium carbonate equivalent: 5 to 15 percent (calcium carbonate accumulations greater than 5 percent fine and medium masses and coatings on faces of peds)
Rock fragments: 0 to 10 percent gravel
Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

CBk or C horizon
Hue: 2.5YR, 5YR
Value: 5 to 7 dry, 4 moist
Texture: loamy fine sand, fine sand
Clay content: 1 to 10 percent
Calcium carbonate equivalent: 5 to 15 percent (calcium carbonate accumulations less than 5 percent fine and medium masses)
Rock fragments: 0 to 15 percent gravel
Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)
Calcic horizon is recognized at 19 to 33 inches (Bk2 and Bk3) in the typical pedon.

Mido, strongly calcareous soils
Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 57)
Landform: Sand sheets, dunes
Geology: Eolian and Alluvial Deposits (Quaternary)
Parent material: eolian sands and slope alluvium derived from sandstone
Slope: 5 to 15 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	50-60
Litter <5mm:	10-15
Rock Fragments:	0
Bare Soil:	0-5
Cyanobacteria Crust:	30-40
Lichen Crust:	0-5
Moss Crust:	5-15
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 5.8 (moderate)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: low
Hydrologic group: A
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none

Figure 57.—Profile of Mido, strongly calcareous soil in map unit 108. Scale is in centimeters.

Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Semidesert Sand (Fourwing Saltbush)

Ecological site number: R035XY212UT
Present vegetation (in most areas): Cutler Mormon tea, winterfat, cryptantha, Indian ricegrass, fourwing saltbush, galleta, needle and thread, plains pricklypear
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 619,636 meters E, 4289,453 meters N, zone 12.

A—0 to 5 inches (0 to 13 cm); reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 4/6), moist; 7 percent clay; moderate coarse, fine, and medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many very fine and common fine roots throughout; common very fine and fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bk1—5 to 14 inches (13 to 35 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/8), moist; 10 percent clay; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots throughout; common very fine and fine irregular pores; common fine spherical carbonate nodules in matrix; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bk2—14 to 44 inches (35 to 112 cm); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6), moist; 10 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and medium roots throughout, and common very coarse roots at top of horizon; common very fine and fine irregular pores; common fine spherical carbonate nodules in matrix; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk3—44 to 49 inches (112 to 125 cm); reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 4/6), moist; 10 percent clay; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and medium roots throughout; few very fine and fine irregular pores; common fine spherical carbonate nodules in matrix; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Ck1—49 to 73 inches (125 to 185 cm); reddish yellow (5YR 7/6) fine sand, yellowish red (5YR 5/6), moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; few fine and medium roots throughout; few very fine and fine irregular pores; common coarse irregular carbonate nodules in matrix; 5 percent fine gravel and 2 percent gravel; violently effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Ck2—73 to 80.5 inches (185 to 205 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 5/6), moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; few medium roots throughout; few very fine and fine irregular pores; common coarse irregular carbonate nodules in matrix; 2 percent fine gravel and 2 percent gravel; violently effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon

Value: 5 or 6 dry, 3 or 4 moist
Chroma: 6 or 8 dry, 4 or 6 moist
Texture: loamy fine sand, fine sand
Clay content: 1 to 8 percent
Calcium carbonate equivalent: 0 to 5 percent

Rock fragments: 0 to 5 percent gravel

Bk horizons
Value: 4 to 6 dry, 4 or 5 moist
Chroma: 6 or 8, dry or moist
Texture: loamy fine sand, fine sand
Clay content: 1 to 10 percent
Calcium carbonate equivalent: 1 to 5 percent (consists of sand-sized, wind-blown calcium carbonate fragments)
Rock fragments: 0 to 5 percent gravel

Ck horizons
Value: 4 to 7 dry, 4 or 5 moist
Clay content: 1 to 5 percent
Calcium carbonate equivalent: 1 to 5 percent (consists of sand-sized, wind-blown calcium carbonate fragments)
Rock fragments: 0 to 5 percent gravel
Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

110—Bowington-Radnik-Patterfield complex, 0 to 6 percent slopes

Map Unit Setting

General setting: Salt and Courthouse Washes, Arches National Park.
Elevation: 3,960 to 4,830 feet (1,206 to 1,471 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Bowington and similar soils: 50 percent
Radnik and similar soils: 25 percent
Patterfield and similar soils: 20 percent
Minor components:
- Reef soils–Semidesert Shallow Sandy Loam (Blackbrush)
- Quicksand with no vegetation (fig. 58)
- Mido soils–Semidesert Sand (Dune)

Soil Properties and Qualities

Bowington soils
Taxonomic classification: Sandy, mixed, mesic Oxyaquic Torrifluvents (fig. 59)
Landform: Flood-plain steps (fig. 60)
Geology: Alluvial Deposits (Quaternary)
Parent material: alluvium derived from sandstone
Slope: 0 to 3 percent, southeast to northwest aspects

Ground Cover:	(% Cover)
Plant Canopy:	40-60
Litter <5mm:	5-20
Rock Fragments:	0

Figure 58.—Quicksand in map unit 110.

Bare Soil:	20-40
Cyanobacteria Crust:	0-5
Lichen Crust:	0-5
Moss Crust:	0-2
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: moderately well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity total inches: about 4.4 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: frequent, very brief (fig. 61)
Ponding hazard: none
Seasonal water table minimum depth: about 20 to 39 inches
Runoff class: negligible
Hydrologic group: B
Calcium carbonate equivalent maximum: about 10 percent
Gypsum maximum: none
Salinity maximum: about 1 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Semiwet Fresh Streambank (Fremont Cottonwood)
Ecological site number: R035XY013UT
Present vegetation (in most areas): China tamarisk, Fremont cottonwood, coyote willow, inland saltgrass
Land capability (non irrigated): 7w

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 617,472 meters E, 4282,065 meters N, zone 12.

C1—0 to 1 inch (0 to 2 cm); light brown (7.5YR 6/4) very fine sand, brown (7.5YR 4/4), moist; 1 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine and common

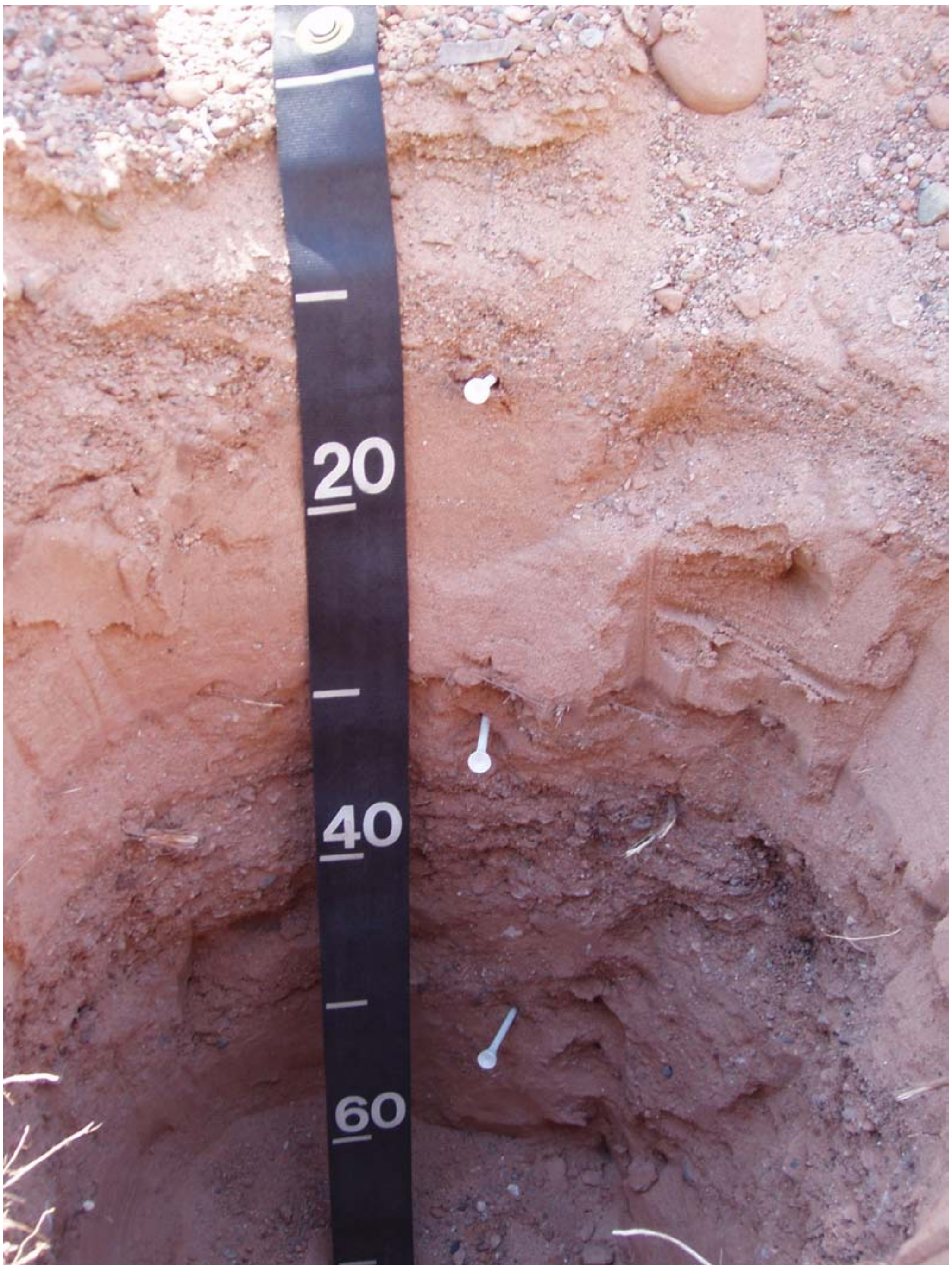

Figure 59.—Profile of Bowington soil in map unit 110. Scale is in centimeters.

Figure 60.—Landscape of Bowington soil component in map unit 110 (Bowington-Radnik-Patterfield complex, 0 to 6 percent slopes).

fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.4; very abrupt wavy boundary.

C2—1 inch to 10 inches (2 to 26 cm); light reddish brown (5YR 6/4) fine sand, reddish brown (5YR 5/4), moist; 1 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C3—10 to 25 inches (26 to 63 cm); pink (5YR 7/4) fine sand, reddish brown (5YR 5/4), moist; 1 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; common very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C4—25 to 33 inches (63 to 84 cm); pink (7.5YR 7/4) very fine sand, reddish brown (5YR 4/4), moist; 2 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine irregular pores; 5 percent fine dendritic yellowish red (5YR 4/6), moist, iron-manganese masses on surfaces along pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C5—33 to 38 inches (84 to 96 cm); pink (7.5YR 7/3) fine sand, reddish brown (5YR 5/4), moist; 2 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C6—38 to 43.5 inches (96 to 110 cm); pink (7.5YR 7/4) coarse sand, brown (7.5YR 5/4), moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine interstitial pores; few

prominent black (5YR 2.5/1), moist, organic stains between sand grains; very slightly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

C7—43.5 to 48 inches (110 to 122 cm); pink (7.5YR 7/3) sand, brown (7.5YR 5/4), moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; 10 percent gravel; very slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Figure 61.—Flood debris caught in a tree in Bowington soil component of map unit 110.

C8—48 to 51.5 inches (122 to 131 cm); coarse sand, brown (7.5YR 4/4), moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; 10 percent gravel; slightly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.
C9—51.5 to 78.5 inches (131 to 200 cm); coarse sand, brown (7.5YR 4/4), moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; 10 percent gravel; very slightly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Surface C horizon
Hue: 5YR, 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Texture: very fine sand, fine sand
Clay content: 1 to 5 percent
Calcium carbonate equivalent: 1 to 10 percent
Rock fragments: none

Subsurface C horizons above 39 inches (100 cm)
Hue: 5YR, 7.5YR
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 3 to 6 dry, 4 or 6 moist
Texture: fine sand, very fine sand, sand
Clay content: 1 to 5 percent
Calcium carbonate equivalent: 1 to 10 percent
Rock fragments: 0 to 5 percent gravel
Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

C horizons below 39 inches (100 cm)
Hue: 5YR, 7.5YR
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 3 to 6 dry, 4 or 6 moist
Texture: coarse sand, sand, fine sand
Clay content: 1 to 5 percent
Calcium carbonate equivalent: 1 to 10 percent
Rock fragments: 0 to 35 percent gravel

Depth to redoximorphic features: 20 to 39 inches (50 to 100 cm)

Radnik soils
Taxonomic classification: Sandy, mixed, mesic Ustic Torrifluvents (fig. 62)
Landform: High flood-plain steps (fig. 63)
Geology: Alluvial Deposits (Quaternary)
Parent material: alluvium derived from sandstone
Slope: 0 to 6 percent, southeast to south aspects

Ground Cover:	(% Cover)
Plant Canopy:	30-50
Litter <5mm:	5-10
Rock Fragments:	0
Bare Soil:	5-10
Cyanobacteria Crust:	20-40
Lichen Crust:	5-10
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: excessively drained

Figure 62.—Profile of Radnik soil in map unit 110. Scale is in centimeters on the left, inches on the right.

Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity total inches: about 4.8 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: occasional, extremely brief
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: very low
Hydrologic group: A

Figure 63.—Landscape of Radnik soil component (foreground) in map unit 110 (Bowington-Radnik-Patterfield complex, 0 to 6 percent slopes).

Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none
Salinity maximum: about 1 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Loamy Bottom (Basin Big Sagebrush)
Ecological site number: R035XY011UT
Present vegetation (in most areas): fourwing saltbush, basin big sagebrush, Fremont cottonwood, sumac, Indian ricegrass
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 619,274 meters E, 4279,933 meters N, zone 12.

A—0 to 4.5 inches (0 to 12 cm); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 4/6), moist; 4 percent clay; weak fine subangular blocky and moderate medium platy structure; soft, very friable, slightly sticky and nonplastic; many very fine, and common fine and medium roots throughout; many very fine and fine, and common medium tubular pores; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bw1—4.5 to 13.5 inches (12 to 34 cm); reddish yellow (5YR 6/8) fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; weak medium and moderate fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine, and common fine and medium roots throughout; many very fine irregular, few fine tubular, and common fine irregular pores; strongly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Bw2—13.5 to 23 inches (34 to 58 cm); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4), moist; 10 percent clay; weak very coarse prismatic parting to moderate coarse subangular blocky structure; hard, friable, slightly sticky and nonplastic; common very fine, fine, and medium, and few very coarse roots throughout; many very fine and common fine tubular pores; strongly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

C1—23 to 36.5 inches (58 to 93 cm); pink (7.5YR 7/4) sand, brown (7.5YR 4/4), moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine, and few medium roots throughout; many very fine and common fine interstitial pores; strongly effervescent; strongly alkaline, pH 8.6; gradual smooth boundary.

C2—36.5 to 43.5 inches (93 to 110 cm); reddish yellow (5YR 7/6) sand, yellowish red (5YR 4/6), moist; 4 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common very fine and fine, and few medium roots throughout; common very fine and fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

C3—43.5 to 57 inches (110 to 145 cm); reddish yellow (5YR 7/6) sand, yellowish red (5YR 4/6), moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; common very fine, fine, and coarse throughout; common very fine and fine interstitial pores; very slightly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C4—57 to 82.5 inches (145 to 210 cm); pink (7.5YR 7/4) sand, strong brown (7.5YR 5/6), moist; 2 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common very fine, fine, and medium roots throughout; common very fine and fine irregular pores; slightly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

This soil is a taxadjunct to the Radnik series because this soil is sandy throughout the profile.

A horizon
- Hue: 5YR, 7.5YR
- Value: 5 or 6 dry, 4 moist
- Chroma: 4 or 6, dry or moist
- Texture: fine sand, loamy fine sand, fine sandy loam
- Clay content: 4 to 12 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Rock fragments: none
- Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

Bw horizon
- Hue: 5YR, 7.5YR
- Value: 5 or 6 dry, 4 moist
- Chroma: 4 to 8 dry, 4 or 6 moist
- Texture: fine sand, loamy fine sand
- Clay content: 2 to 12 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Rock fragments: none
- Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

C horizon
- Hue: 5YR, 7.5YR
- Value: 6 or 7 dry, 4 or 5 moist
- Chroma: 4 or 6, dry or moist
- Texture: sand, fine sand
- Clay content: 1 to 5 percent

Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: 0 to 5 percent gravel
Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

Patterfield soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustifluventic Haplocambids (fig. 64)

Figure 64.—Profile of Patterfield soil in map unit 110. Scale is in centimeters.

Landform: High stream terraces (fig. 65)
Geology: Alluvial Deposits (Quaternary)
Parent material: alluvium derived from sandstone and shale
Slope: 0 to 6 percent, south to west aspects

Ground Cover:	(% Cover)
Plant Canopy:	20-40
Litter <5mm:	5-10
Rock Fragments:	0-5
Bare Soil:	5-10
Cyanobacteria Crust:	5-15
Lichen Crust:	5-15
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity total inches: about 11.9 (very high)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: very rare, extremely brief
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: low
Hydrologic group: B
Calcium carbonate equivalent maximum: about 15 percent

Figure 65.—Landscape of Patterfield soil component (foreground) in map unit 110 (Bowington-Radnik-Patterfield complex, 0 to 6 percent slopes).

Gypsum maximum: about 3 percent
Salinity maximum: about 30 mmhos/cm (strongly saline) in the surface
Sodium adsorption ratio (SAR) maximum: about 30 SAR (strongly sodic) in the surface
Ecological site name: Alkali Flat (Greasewood)
Ecological site number: R035XY009UT
Present vegetation (in most areas): cheatgrass, greasewood, seepweed, galleta, shadscale saltbush, Indian ricegrass
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 628,958 meters E, 4288,040 meters N, zone 12.

A—0 to 6 inches (0 to 15 cm); pale yellow (2.5Y 7/3) sandy loam, light yellowish brown (2.5Y 6/4), moist; 18 percent clay; moderate medium and thin platy structure; hard, firm, moderately sticky and slightly plastic; common very fine and fine roots throughout; many very fine and fine vesicular pores; 5 percent channers; violently effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

By1—6 to 29 inches (15 to 74 cm); light yellowish brown (2.5Y 6/3) sandy clay loam, light olive brown (2.5Y 5/3), moist; 20 percent clay; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; common fine and few medium roots throughout; common very fine and fine irregular pores; few fine spherical gypsum crystals in matrix and common very fine threadlike gypsum crystals on faces of peds; 2 percent gravel; violently effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

By2—29 to 40 inches (74 to 101 cm); light brown (7.5YR 6/4) fine sandy loam, strong brown (7.5YR 5/6), moist; 12 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and few medium roots throughout; common very fine and fine irregular pores; common fine spherical gypsum crystals in matrix and common very fine threadlike gypsum crystals on faces of peds; 1 percent gravel; violently effervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

By3—40 to 65.5 inches (101 to 166 cm); light yellowish brown (2.5Y 6/4) sandy clay loam, olive brown (2.5Y 4/3), moist; 26 percent clay; moderate medium and coarse subangular blocky structure; hard, firm, moderately sticky and slightly plastic; common very fine vesicular pores; common very fine threadlike gypsum crystals on faces of peds; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

By4—65.5 to 78.5 inches (166 to 200 cm); light yellowish brown (2.5Y 6/4) sandy clay loam, olive brown (2.5Y 4/3), moist; 23 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and slightly plastic; common very fine vesicular pores; common very fine threadlike gypsum crystals on faces of peds and common very fine spherical gypsum crystals in matrix; violently effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Range in Characteristics

This soil is coarse-loamy, and is a taxadjunct to the Patterfield series which is fine-loamy.

A horizon
Hue: 7.5YR, 10YR, 2.5Y
Value: 6 or 7 dry, 4 to 6 moist

Chroma: 3 or 4, dry or moist
Clay content: 12 to 18 percent
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 16 to 30 ds/m
Sodium adsorption ratio: 13 to 30
Gypsum: 0 to 3 percent
Rock fragments: 0 to 5 percent channers
Reaction: strongly alkaline or very strongly alkaline (8.5 to 9.4)

By horizon:
Hue: 7.5YR, 10YR, 2.5Y
Value: 6 or 7 dry, 4 or 5 moist
Chroma: 3 or 4 dry, 3 to 6 moist
Texture: sandy clay loam, fine sandy loam, silt loam
Clay content: 12 to 27 percent (averages 12 to 18 percent in the particle size control section)
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 5 to 13
Gypsum: 0 to 3 percent
Rock fragments: 0 to 5 percent gravel
Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

This soil has less than 5 percent gypsum and does not have a gypsic horizon. Stratifications and very rare flooding are evidence of irregular organic carbon.

111—Hanksville-Persayo complex, 2 to 45 percent slopes

Map Unit Setting

General setting: Hills in Cache Valley, Arches National Park
Elevation: 4,300 to 4,520 feet (1,311 to 1,379 meters)
Mean annual precipitation: 7 to 9 inches (178 to 229 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Hanksville and similar soils: 45 percent
Persayo and similar soils: 45 percent
Minor components:
• Monue soils–Desert Stony Loam (Shadscale/Budsage)

Soil Properties and Qualities

Hanksville soils
Taxonomic classification: Clayey, mixed, active, calcareous, mesic, shallow Typic Torriorthents (fig. 66)
Landform: Hills
Geology: Mancos Formation (Cretaceous)
Parent material: residuum weathered from shale

Figure 66.—Profile of Hanksville soil in map unit 111. Paralithic contact is at 40 centimeters.

Slope: 2 to 45 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	30-50
Litter <5mm:	0-5
Rock Fragments:	20-25
Bare Soil:	50-60
Cyanobacteria Crust:	0-5
Lichen Crust:	0-5
Moss Crust:	0-5
Salt Crust:	1-5
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 20 inches to bedrock, paralithic
Drainage class: well drained
Slowest permeability: .001 to .06 in/hr (moderately slow)
Available water capacity total inches: about 3.1 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: very high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 30 percent
Gypsum maximum: about 10 percent
Salinity maximum: about 20 mmhos/cm (strongly saline)
Sodium adsorption ratio (SAR) maximum: about 40 SAR (strongly sodic)
Ecological site name: Desert Shallow Clay (Mat Saltbush)
Ecological site number: R035XY124UT
Present vegetation (in most areas): mat saltbush, valley saltbush, galleta, Indian ricegrass
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 630,096 meters E, 4287,695 meters N, zone 12.

A—0 to 3 inches (0 to 8 cm); grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2), moist; 34 percent clay; weak fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; common very fine and fine roots throughout; many very fine and common fine irregular pores; 10 percent parachanners; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C—3 to 19.5 inches (8 to 49 cm); grayish brown (2.5Y 5/2) very parachannery silty clay loam, dark grayish brown (2.5Y 4/2), moist; 38 percent clay; massive; soft, very friable, moderately sticky and moderately plastic; many very fine, and common fine and medium roots throughout; many very fine and common fine irregular pores; 50 percent parachanners; strongly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Cr—19.5 to 60 inches (49 to 152 cm); soft Mancos Formation shale bedrock.

Range in Characteristics

Hanksville taxadjunct soils have a paralithic contact at 4 to 20 inches, in contrast with the official series.

A horizon
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 2 or 3 dry, 2 to 4 moist
- Texture: silty clay loam, clay loam
- Clay content: 27 to 35 percent
- Calcium carbonate equivalent: 5 to 30 percent
- Rock fragments: 5 to 15 percent parachanners
- Electrical Conductivity: 2 to 16 ds/m
- Sodium adsorption ratio: 2 to 15
- Gypsum: 1 to 10 percent

C horizon
- Value: 5 to 7 dry, 4 or 5 moist
- Chroma: 2 or 3, dry or moist
- Clay content: 35 to 45 percent (particle-size control section averages greater than 35 percent)
- Calcium carbonate equivalent: 5 to 30 percent
- Rock fragments: 10 to 50 percent parachanners
- Electrical Conductivity: 8 to 20 ds/m
- Sodium Absorption Ratio: 15 to 40
- Gypsum: 1 to 10 percent
- Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

Persayo soils

Taxonomic classification: Loamy, mixed, active, calcareous, mesic, shallow Typic Torriorthents (fig. 67)
Landform: Hills (fig. 68)
Geology: Mancos Formation (Cretaceous)
Parent material: residuum weathered from shale
Slope: 2 to 45 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	30-40
Litter <5mm:	5-10
Rock Fragments:	10-20
Bare Soil:	40-60
Cyanobacteria Crust:	0-5
Lichen Crust:	0-5
Moss Crust:	0-5
Salt Crust:	1-5
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 20 inches to bedrock, paralithic
Drainage class: well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity total inches: about 1.3 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: very high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 30 percent
Gypsum maximum: about 10 percent
Salinity maximum: about 8 mmhos/cm (slightly saline)
Sodium adsorption ratio (SAR) maximum: about 3 SAR (slightly sodic)

Figure 67.—Profile of Persayo soil in map unit 111. Paralithic contact is at 20 centimeters. Scale is in centimeters on the left, inches on the right.

Ecological site name: Desert Clay
Ecological site number: R035XY103UT
Present vegetation (in most areas): valley saltbush, bud sagebrush, desert trumpet buckwheat, mat saltbush
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 630,902 meters E, 4287,771 meters N, zone 12.

A—0 to 2.5 inches (0 to 6 cm); olive yellow (2.5Y 6/6) clay loam, light olive brown (2.5Y 5/4), moist; 33 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky and very plastic; many very fine

and common fine roots throughout; many very fine and common fine irregular pores; 5 percent gravel and 8 percent channers; strongly effervescent; slightly alkaline, pH 7.6; clear smooth boundary.

BCy—2.5 to 8 inches (6 to 20 cm); light yellowish brown (2.5Y 6/4) parachannery clay loam, light olive brown (2.5Y 5/6), moist; 34 percent clay; weak medium and fine subangular blocky structure; slightly hard, friable, moderately sticky and very plastic; common very fine and few fine roots throughout; common very fine and fine irregular pores; many fine irregular gypsum crystals in matrix; 15 percent parachanners; slightly effervescent; slightly alkaline, pH 7.8; gradual smooth boundary.

Cr—8 to 14 inches (20 to 35 cm); soft Mancos Formation shale bedrock; common fine roots in cracks.

Range in Characteristics

A horizon
- Hue: 10YR, 2.5Y
- Chroma: 3 to 6 dry, 2 to 4 moist
- Texture: clay loam, silt loam, silty clay loam
- Clay content: 27 to 35 percent
- Calcium carbonate equivalent: 10 to 30 percent
- Rock fragments: 0 to 15 percent gravel or channers
- Electrical Conductivity: 2 to 8 ds/m
- Sodium adsorption ratio: 0 to 3
- Gypsum: 1 to 10 percent
- Reaction: neutral or slightly alkaline (6.6 to 7.8)

Figure 68.—Landscape of Persayo component (foreground) in map unit 111 – Hanksville-Persayo complex, 2 to 45 percent slopes.

BCy or C horizons
- Hue: 10YR, 2.5Y
- Value: 5 or 6 dry, 4 or 5 moist
- Chroma: 2 to 4 dry, 2 to 6 moist
- Texture: clay loam, silty clay loam
- Clay content: 27 to 35 percent
- Calcium carbonate equivalent: 5 to 30 percent
- Rock fragments: 10 to 20 percent parachanners (some horizons have up to 50 percent parachanners)
- Electrical Conductivity: 4 to 16 ds/m
- Sodium adsorption ratio: 0 to 3
- Gypsum: 1 to 10 percent
- Reaction: neutral or slightly alkaline (6.6 to 7.8)

116—Begay fine sandy loam, 0 to 2 percent slopes, overwash

Map Unit Setting

General setting: Salt Valley, Eagle Park, and Winter Camp regions of Arches National Park
Elevation: 4,750 to 5,370 feet (1,448 to 1,637 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Begay, overwash and similar soils: 90 percent
Minor components:
- Milok soils–Semidesert Sandy Loam (Fourwing Saltbush)
- Mido soils–Semidesert Sand (Fourwing Saltbush)

Soil Properties and Qualities

Begay, overwash soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 69)
Landform: Sand sheets (fig. 70)
Geology: Eolian and Alluvial Deposits (Quaternary)
Parent material: alluvium derived from sandstone and/or eolian deposits derived from sandstone
Slope: 0 to 2 percent, north aspect

Ground Cover:	(% Cover) (fig. 71)
Plant Canopy:	75-85
Litter <5mm:	0-5
Rock Fragments:	0
Bare Soil:	5-10
Cyanobacteria Crust:	10-20
Lichen Crust:	0-5
Moss Crust:	0-5
Salt Crust:	0
Gypsum Crust:	0

Figure 69.—Profile of Begay soil in map unit 116. Scale is in centimeters.

Depth to restrictive feature(s): greater than 60 inches
Drainage class: well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)

Figure 70.—Landscape of map unit 116 (Begay fine sandy loam, 0 to 2 percent slopes).

Figure 71.—Typical soil surface of map unit 116.

Available water capacity total inches: about 8.8 (high)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: negligible
Hydrologic group: A
Calcium carbonate equivalent maximum: about 15 percent
Gypsum maximum: none
Salinity maximum: about 1 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Fourwing Saltbush)
Ecological site number: R035XY215UT
Present vegetation (in most areas): cheatgrass, galleta, sand dropseed, fourwing saltbush, prickly Russian thistle
Land capability (non irrigated): 6c

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 615,008 meters E, 4295,739 meters N, zone 12.

A—0 to 4.5 inches (0 to 11 cm); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 4/4), moist; 4 percent clay; moderate fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots throughout; many very fine and fine tubular pores; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw—4.5 to 11.5 inches (11 to 29 cm); yellowish red (5YR 5/6) loamy fine sand, reddish brown (5YR 4/4), moist; 6 percent clay; weak very thick platy parting to moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots throughout; many very fine and common fine tubular pores; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk1—11.5 to 23.5 inches (29 to 60 cm); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4), moist; 17 percent clay; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine and fine, and common medium tubular pores; few fine cylindrical carbonate masses in matrix; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bk2—23.5 to 49 inches (60 to 125 cm); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4), moist; 15 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine and fine, and common medium tubular pores; few fine cylindrical carbonate masses in matrix; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

B—49 to 72 inches (125 to 183 cm); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4), moist; 12 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots throughout; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

The Bk horizons in this soil do not have enough visible secondary carbonate to qualify as a calcic horizon.

A horizon
Hue: 5YR, 7.5YR
Chroma: 3 to 6 dry, 3 or 4 moist
Texture: fine sand, fine sandy loam, loamy fine sand
Clay content: 3 to 10 percent
Calcium carbonate equivalent: 1 to 10 percent
Rock fragments: 0 to 5 percent

Bw horizon
Hue: 7.5YR, 5YR
Chroma: 3 to 6 dry, 4 moist
Texture: loamy fine sand, fine sandy loam, very fine sandy loam
Clay content: 5 to 18 percent
Calcium carbonate equivalent: 5 to 15 percent
Rock fragments: 0 to 5 percent

Bk horizons
Hue: 7.5YR, 5YR
Value: 5 dry, 4 to 6 moist
Chroma: 3 to 6 dry, 4 moist
Texture: fine sandy loam, very fine sandy loam
Clay content: 5 to 18 percent
Calcium carbonate equivalent: 5 to 15 percent
Rock fragments: 0 to 5 percent

B, C, or Ck horizons (where present)
Hue: 5YR, 7.5YR
Chroma: 4 or 6, dry or moist
Texture: loamy fine sand, fine sandy loam, loam
Clay content: 3 to 15 percent
Calcium carbonate equivalent: 5 to 15 percent
Rock fragments: 0 to 5 percent gravel

117—Rock outcrop-Arches complex, 2 to 15 percent slopes

Map Unit Setting

General setting: “Petrified dune” areas in Arches National Park
Elevation: 3,960 to 5,520 feet (1,206 to 1,683 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Rock outcrop, Navajo Formation Sandstone: 65 percent
Arches and similar soils: 25 percent
Minor components:
- Mido, strongly calcareous soils–Semidesert Sand (Blackbrush)
- Rizno soils–Semidesert Shallow Sandy Loam (Blackbrush)
- Mido soils–Semidesert Sand (Fourwing Saltbush)
- Other shallow sandy soils–Semidesert Shallow Sandy Loam (Utah Juniper/Pinyon)

Soil Properties and Qualities

Rock outcrop, Navajo Formation Sandstone

This component is characterized by gently rolling expanses of sandstone dissected by short to moderate escarpments. Vertical relief varies from a few to 20 or more feet. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain. Slopes generally range from 2 to 99 percent.

Arches soils

Taxonomic classification: Mixed, mesic Lithic Torripsamments (fig. 72)
Landform: Mesas (fig. 73)
Geology: Navajo Formation (Jurassic)
Parent material: eolian deposits derived from sandstone
Slope: 2 to 15 percent, south to west aspects

Ground Cover:	(% Cover)
Plant Canopy:	40-65
Litter <5mm:	2-1
Rock Fragments:	5-10
Bare Soil:	0-10
Cyanobacteria Crust:	20-25
Lichen Crust:	10-15
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Figure 72.—Profile of Arches soil in map unit 117. Paralithic contact is at 21 centimeters, and lithic contact is at 24 centimeters. Small divisions on scale are centimeters.

Figure 73.—Landscape of map unit 117 (Rock outcrop-Arches complex, 2 to 15 percent slopes). Nearly vertical Entrada Formation Sandstone, Main Body Member, component of map unit 85 in background.

Depth to restrictive feature(s): 3 to 10 inches to bedrock, lithic; 3 to 6 inches to bedrock, paralithic
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 0.3 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none
Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Pinyon)
Ecological site number: R035XY019UT
Present vegetation (in most areas): blackbrush, littleleaf mountain-mahogany, Stansbury cliffrose, Utah juniper, desert needlegrass, Bigelow sagebrush, singleleaf ash, twoneedle pinyon
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 622,558 meters E, 4275,511 meters N, zone 12.

A—0 to 1 inch (0 to 3 cm); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 4/4), moist; 4 percent clay; moderate very thick platy and strong medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine and common fine irregular pores; 5 percent channers; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C—1 inch to 4.5 inches (3 to 11 cm); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 4/4), moist; 4 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots throughout; many very fine and common fine irregular pores; 5 percent channers; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

2Cr—4.5 to 6 inches (11 to 15 cm); hard fractured Navajo Formation sandstone bedrock; common fine and medium roots at top of horizon, and common fine roots in cracks; abrupt smooth boundary.

2R—6 inches (15 cm); hard Navajo Formation sandstone bedrock; common medium and coarse roots at top of horizon;

Range in Characteristics

A horizon (where present)
Hue: 5YR, 7.5YR
Chroma: 4 or 6 dry, 4 moist
Clay content: 1 to 5 percent
Calcium carbonate equivalent: 1 to 4 percent
Rock fragments: 0 to 5 percent gravel or channers

C horizon
Hue: 5YR, 7.5YR
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: fine sand, loamy fine sand
Clay content: 2 to 8 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: 0 to 5 percent channers

118—Monue gravelly loamy fine sand, 1 to 6 percent slopes

Map Unit Setting

General setting: Cache Valley in Arches National Park
Elevation: 4,270 to 4,530 feet (1,301 to 1,382 meters)
Mean annual precipitation: 7 to 9 inches (178 to 229 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Monue and similar soils: 90 percent
Minor components:
- Persayo soils–Desert Clay (Castlevalley Saltbush)
- Hanksville soils–Desert Shallow Clay (Mat Saltbush)

Soil Properties and Qualities

Monue soils

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids (fig. 74)
Landform: Fan remnants at toeslopes of cuesta scarps
Geology: Alluvial and Colluvial Deposits (Quaternary)

Figure 74.—Profile of Monue soil in map unit 118. Scale is in centimeters.

Parent material: alluvium over slope alluvium over bouldery colluvium derived from sandstone and shale
Slope: 1 to 6 percent, north to northwest aspects

Ground Cover:	(% Cover)
Plant Canopy:	40-50
Litter <5mm:	5-10
Rock Fragments:	20-30
Bare Soil:	10-30
Cyanobacteria Crust:	10-15
Lichen Crust:	1-6
Moss Crust:	15-20
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity total inches: about 4.2 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: very low
Hydrologic group: A
Calcium carbonate equivalent maximum: about 15 percent
Gypsum maximum: about 1 percent
Salinity maximum: about 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (SAR) maximum: about 5 SAR (slightly sodic)
Ecological site name: Desert Stony Loam (Shadscale-Bud Sagebrush)
Ecological site number: R035XY136UT
Present vegetation (in most areas): bud sagebrush, galleta, Indian ricegrass, cheatgrass, shadscale saltbush
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 629,982 meters E, 4287,805 meters N, zone 12.

A—0 to 2.5 inches (0 to 6 cm); reddish brown (5YR 5/4) gravelly loamy fine sand, reddish brown (5YR 4/4), moist; 6 percent clay; weak fine granular and very fine subangular blocky structure; slightly hard, friable; many very fine and common fine roots throughout; common very fine irregular pores; 18 percent fine gravel; slightly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

AB—2.5 to 6 inches (6 to 15 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 17 percent clay; weak fine subangular blocky structure; very hard, friable; many very fine and common fine roots throughout; common very fine irregular pores; 5 percent fine gravel; strongly effervescent; strongly alkaline, pH 8.6; abrupt wavy boundary.

Bw—6 to 19 inches (15 to 48 cm); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4), moist; 14 percent clay; weak medium and coarse subangular blocky structure; extremely hard, friable; common very fine and fine roots throughout; common fine irregular pores; 5 percent channers; strongly effervescent; strongly alkaline, pH 9.0; clear smooth boundary.

BCk—19 to 33 inches (48 to 84 cm); reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4), moist; 11 percent clay; moderate fine and medium subangular blocky structure; extremely hard, friable; common fine roots throughout; common fine irregular pores; common fine irregular carbonate masses in matrix; 10 percent fine gravel; strongly effervescent; strongly alkaline, pH 8.6; clear wavy boundary.

Ck—33 to 36 inches (84 to 91 cm); reddish brown (5YR 4/4) gravelly sandy loam, dark reddish brown (5YR 3/4), moist; 13 percent clay; single grain; loose; few very fine roots throughout; few fine interstitial pores; common fine irregular carbonate masses in matrix; 16 percent gravel; violently effervescent; strongly alkaline, pH 8.6; abrupt wavy boundary.

2C—36 to 78.5 inches (91 to 200 cm); bouldery material.

Range in Characteristics

A horizon
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 4 or 6, dry or moist
Texture: loamy fine sand, sandy loam, fine sandy loam
Clay content: 5 to 18 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: 5 to 25 percent gravel
Reaction: moderately alkaline or strongly alkaline (7.9 to 9.0)

AB horizon (where present)
Clay content: 10 to 18 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: 5 to 10 percent gravel

Bw horizon
Hue: 2.5YR, 5YR
Value: 4 or 5, dry or moist
Chroma: 3 to 6, dry or moist
Texture: fine sandy loam, sandy loam
Clay content: 10 to 18 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: 5 to 20 percent gravel, channers, and cobbles

BCk or Ck horizon
Texture: fine sandy loam, sandy loam
Clay content: 10 to 18 percent
Calcium carbonate equivalent: 5 to 15 percent
Rock fragments: 5 to 20 percent gravel

Depth to bouldery material–30 to 50 inches (76 to 127 cm)

119—Persayo-Somorent family complex, 15 to 70 percent slopes

Map Unit Setting

General setting: Hills around Cache and Salt Valleys in Arches National Park
Elevation: 4,270 to 4,920 feet (1,302 to 1,499 meters)
Mean annual precipitation: 7 to 9 inches (178 to 229 millimeters)

Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Persayo and similar soils: 50 percent
Somorent family and similar soils: 40 percent
Minor components:
- Shallow soils on steep north-facing slopes–Semidesert Steep Bouldery Loam (Salina Wildrye-Juniper)
- Monue soils–Desert Shallow Clay (Shadscale)
- Rock outcrop (Sandstone)
- Hankville soils–Desert Shallow Clay (Mat Saltbush)

Soil Properties and Qualities

Persayo soils
Taxonomic classification: Loamy, mixed, active, calcareous, mesic, shallow Typic Torriorthents (fig. 75)
Landform: Eroded scarp slopes of hills on cuestas
Geology: Lower Mancos Shale (Cretaceous), Ferron Sandstone Member of Mancos Shale (Cretaceous), and Brushy Basin Member of Morrison Formation (Jurassic)
Parent material: residuum weathered from shale
Slope: 15 to 70 percent, north aspect

Figure 75.—Profile of Persayo soil in map unit 119. Paralithic contact is at 19 centimeters. Scale is in centimeters.

Ground Cover:	(% Cover)
Plant Canopy:	30-40
Litter <5mm:	0-5
Rock Fragments:	10-20
Bare Soil:	40-60
Cyanobacteria Crust:	0-5
Lichen Crust:	0-5
Moss Crust:	0-5
Salt Crust:	1-5
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 16 inches to bedrock, paralithic
Drainage class: well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity total inches: about 2.8 (low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: very high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 15 percent
Gypsum maximum: about 10 percent
Salinity maximum: about 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (SAR) maximum: about 3 SAR (slightly sodic)
Ecological site name: Desert Shallow Sandy Loam (Shadscale)
Ecological site number: R035XY130UT
Present vegetation (in most areas): shadscale saltbush, bud sagebrush, desert trumpet buckwheat, mat saltbush
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 627,314 meters E, 4287,857 meters N, zone 12.

A—0 to 2.5 inches (0 to 6 cm); light brownish gray (2.5Y 6/2) silt loam, light olive brown (2.5Y 5/3), moist; 15 percent clay; weak very thick platy parting to weak very fine granular structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; many very fine irregular pores; 2 percent fossilized shell fragments; violently effervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

C1—2.5 to 10 inches (6 to 25 cm); light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3), moist; 30 percent clay; massive; slightly hard, firm, moderately sticky and moderately plastic; common very fine and fine roots throughout; many very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

C2—10 to 15.5 inches (25 to 40 cm); light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3), moist; 30 percent clay; massive; slightly hard, firm, moderately sticky and moderately plastic; common very fine and fine roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

Cr—15.5 to 25.5 inches (40 to 65 cm); soft tan-colored Mancos Formation shale, with layers of hard effervescent black siltstone and limestone bedrock.

Range in Characteristics

A horizon
- Value: 4 to 6 dry, 3 to 5 moist
- Chroma: 2 or 3, dry or moist
- Texture: silt loam, loam
- Clay content: 10 to 18 percent
- Calcium carbonate equivalent: 5 to 10 percent
- Rock fragments: 0 to 10 percent channers, shell fragments, and gravel-sized gypsum crystals
- Electrical Conductivity: 2 to 8 ds/m
- Sodium adsorption ratio: 0 to 3
- Gypsum: 1 to 10 percent
- Reaction: slightly alkaline or moderately alkaline (7.4 to 8.4)

C horizons
- Value: 4 or 5 dry, 3 or 4 moist
- Chroma: 2 or 3, dry or moist
- Texture: silty clay loam, silt loam, loam, clay loam
- Clay content: 18 to 35 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Rock fragments: 0 to 15 percent channers, gravel, and gravel-sized gypsum crystals
- Electrical Conductivity: 4 to 16 ds/m
- Sodium adsorption ratio: 0 to 3
- Gypsum: 1 to 10 percent
- Reaction: slightly alkaline or moderately alkaline (7.4 to 8.4)

Somorent family soils

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Typic Torriorthents (fig. 76)
Landform: Dipslopes of cuestas (fig. 77)
Geology: Cedar Mountain and Dakota Formations (Cretaceous)
Parent material: residuum weathered from sandstone
Slope: 15 to 35 percent, south to northeast aspects

Ground Cover:	(% Cover)
Plant Canopy:	30-50
Litter <5mm:	0-5
Rock Fragments:	25-40
Bare Soil:	30-40
Cyanobacteria Crust:	5-10
Lichen Crust:	1-5
Moss Crust:	1-5
Salt Crust:	1-5
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 20 inches to bedrock, paralithic; 10 to 20 inches to bedrock, lithic
Drainage class: well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity total inches: about 1.2 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: high

Figure 76.—Profile of Somorent family soil in map unit 119. Paralithic contact is at 23 centimeters, and lithic contact is at 48 centimeters. Scale is in centimeters.

Hydrologic group: D
Calcium carbonate equivalent maximum: about 15 percent
Gypsum maximum: none

Figure 77.—Landscape of Somorent family soil component in map unit 119 (Persayo-Somorent family complex, 15 to 70 percent slopes).

Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Desert Shallow Sandy Loam (Blackbrush)
Ecological site number: R035XY133UT
Present vegetation (in most areas): blackbrush, shadscale saltbush, galleta, Indian ricegrass, Utah juniper
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 627,309 meters E, 4287,976 meters N, zone 12.

A—0 to 5 inches (0 to 13 cm); brown (7.5YR 5/4) gravelly fine sandy loam, brown (7.5YR 4/4), moist; 18 percent clay; moderate fine subangular blocky and weak medium granular structure; soft, very friable, moderately sticky and slightly plastic; common very fine and fine, and few medium roots throughout; many very fine and common fine interstitial pores; 30 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk—5 to 9 inches (13 to 23 cm); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6), moist; 19 percent clay; moderate medium and fine subangular blocky structure; slightly hard, friable, moderately sticky and slightly plastic; common very fine and fine, and few medium roots throughout; many very fine and common fine tubular pores; common fine and medium irregular carbonate masses in matrix; 5 percent fine gravel; violently effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cr—9 to 19 inches (23 to 48 cm); soft Dakota sandstone and conglomerate bedrock;

common fine roots in cracks; many discontinuous prominent carbonate coats on rock fragments.
R—19 inches (48 cm); hard Dakota sandstone bedrock.

Range in Characteristics

Somorent family soils have a wider range of colors and textures than the original series.

A horizon
- Value: 5 or 6 dry, 4 to 6 moist
- Chroma: 3 to 6 dry, 4 or 6 moist
- Texture: fine sandy loam, sandy loam, loamy coarse sand
- Clay content: 10 to 18 percent
- Calcium carbonate equivalent: 1 to 10 percent
- Rock fragments: 10 to 35 percent gravel

Bw or Bk horizon
- Hue: 5YR, 7.5YR
- Value: 5 dry, 3 or 4 moist
- Chroma: 3 to 6, dry or moist
- Texture: fine sandy loam, loam, coarse sandy loam
- Clay content: 10 to 25 percent
- Calcium carbonate equivalent: 5 to 15 percent
- Rock fragments: 5 to 35 percent gravel

126—Rizno-Arches-Mido complex, 2 to 15 percent slopes, very rocky

Map Unit Setting

General setting: Mesas and sand sheets in “Petrified dune” areas of Arches National Park
Elevation: 4,070 to 5,370 feet (1,241 to 1,638 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Rizno and similar soils: 60 percent
Arches and similar soils: 20 percent
Mido and similar soils: 10 percent
Minor components:
- Loamy soils deeper than 20 inches–Semidesert Sandy Loam (Blackbrush)
- Rock outcrop–Navajo Formation (Sandstone)
- Mido soils–Semidesert Sand (Dune)
- Mido, strongly calcareous soils–Semidesert Sand (Blackbrush)
- Crosscan family soils–Semidesert Shallow Sandy Loam (Utah Juniper/Blackbrush)

Soil Properties and Qualities

Rizno soils
Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 78)

Landform: Mesas and cuestas (fig. 79)
Geology: Navajo Formation (Jurassic)
Parent material: reworked eolian deposits derived from sandstone
Slope: 2 to 15 percent, east to northwest aspects

Ground Cover:	(% Cover)
Plant Canopy:	40-50
Litter <5mm:	2-5
Rock Fragments:	15-20
Bare Soil:	10-20
Cyanobacteria Crust:	30-40

Figure 78.—Profile of Rizno soil in map unit 126. Lithic contact is at 33 centimeters. Scale shows centimeters on the left, and inches on the right.

Lichen Crust:	1-5
Moss Crust:	10-15
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 7 to 13 inches to bedrock, paralithic; 11 to 20 inches to bedrock, lithic
Drainage class: well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity total inches: about 1.1 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none
Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sandy Loam (Blackbrush)
Ecological site number: R035XY233UT
Present vegetation (in most areas): blackbrush, Cutler Mormon tea, plains pricklypear
Land capability (non irrigated): 7s

Figure 79.—Landscape of Rizno soil component in map unit 126 (Rizno-Arches-Mido complex, 2 to 15 percent slopes, very rocky).

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 623,433 meters E, 4282,239 meters N, zone 12.

A—0 to 2.5 inches (0 to 6 cm); reddish brown (5YR 5/4) very fine sand, reddish brown (5YR 4/4), moist; 4 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine irregular pores; 6 percent gravel; slightly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bw1—2.5 to 7.5 inches (6 to 19 cm); reddish brown (5YR 5/4) very fine sand, reddish brown (5YR 4/4), moist; 5 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine irregular pores; 5 percent gravel; slightly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bw2—7.5 to 13 inches (19 to 33 cm); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4), moist; 10 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many very fine, and common fine and medium roots throughout; many very fine and common fine tubular pores; 10 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

2Cr—13 to 15 inches (33 to 38 cm); soft Navajo sandstone bedrock; abrupt wavy boundary.

2R—15 inches (38 cm); hard Navajo sandstone bedrock.

Range in Characteristics

A horizon
- Hue: 5YR, 7.5YR
- Value: 4 or 5 dry, 4 moist
- Chroma: 4 or 6 dry, moist
- Texture: very fine sand, fine sand, loamy fine sand
- Clay content: 2 to 10 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Rock fragments: 0 to 10 percent channers or gravel

Bw horizon
- Value: 4 or 5 dry, 3 or 4 moist
- Chroma: 4 or 6, dry or moist
- Texture: fine sandy loam, very fine sand, loamy very fine sand, very fine sandy loam
- Clay content: 5 to 18 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Rock fragments: 5 to 35 percent gravel

Bw horizons are too thin or too coarse to qualify as cambic horizons. Some pedons have C horizons as well.

Arches soils

Taxonomic classification: Mixed, mesic Lithic Torripsamments (fig. 80)
Landform: Dunes on mesas, shrub-coppice dunes on mesas, cuestas (fig. 81)
Geology: Navajo Formation (Jurassic)
Parent material: eolian deposits derived from sandstone
Slope: 2 to 15 percent, northeast to south aspects

Ground Cover:	(% Cover)
Plant Canopy:	40-65
Litter <5mm:	2-10
Rock Fragments:	5-10
Bare Soil:	0-10
Cyanobacteria Crust:	20-25

Figure 80.—Profile of Arches soil in map unit 126. Lithic contact is at 28 centimeters. The small divisions on scale are centimeters.

Lichen Crust:	10-15
Moss Crust:	5-10
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 4 to 20 inches to bedrock, lithic
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 0.7 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: medium
Hydrologic group: D
Calcium carbonate equivalent maximum: about 8 percent
Gypsum maximum: none
Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Pinyon)
Ecological site number: R035XY019UT
Present vegetation (in most areas): Havard oak, Utah juniper, singleleaf ash, galleta, Cutler Mormon tea, Stansbury cliffrose, broom snakeweed, Indian ricegrass
Land capability (non irrigated): 7s

Figure 81.—Landscape of Arches component in map unit 126 (Rizno-Arches-Mido complex, 2 to 15 percent slopes, very rocky). Nearly vertical Entrada Formation Sandstone, Main Body Member, component of map unit 85 in background.

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 622,769 meters E, 4279,074 meters N, zone 12.

A—0 to 1.5 inches (0 to 4 cm); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 4/4), moist; 1 percent clay; moderate thick platy and weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine irregular pores; slightly effervescent; slightly alkaline, pH 7.6; very abrupt smooth boundary.

C—1.5 to 11.5 inches (4 to 29 cm); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 4/4), moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and fine roots throughout; many very fine interstitial pores; slightly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

2R—11.5 inches (29 cm); hard Navajo Formation sandstone bedrock.

Range in Characteristics

A horizon (where present)
- Value: 5 or 6 dry, 4 moist
- Clay content: 1 to 5 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Rock fragments: none
- Reaction: slightly alkaline or moderately alkaline (7.4 to 8.4)

C horizon
- Clay content: 1 to 5 percent
- Calcium carbonate equivalent: 1 to 8 percent
- Rock fragments: 0 to 5 percent gravel
- Reaction: slightly alkaline or moderately alkaline (7.4 to 8.4)

Mido soils

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 82)
Landform: Dunes on mesas and cuestas (fig. 83)
Geology: Navajo Formation (Jurassic)
Parent material: eolian sands derived from sandstone
Slope: 6 to 15 percent, northeast to south aspects

Ground Cover:	(% Cover)
Plant Canopy:	30-40
Litter <5mm:	10-15
Rock Fragments:	0
Bare Soil:	5-15
Cyanobacteria Crust:	40-50
Lichen Crust:	0-5
Moss Crust:	0-5
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 4.4 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches

Figure 82.—Profile of Mido soil in map unit 126. Scale is in centimeters.

Runoff class: low
Hydrologic group: A
Calcium carbonate equivalent maximum: about 5 percent
Gypsum maximum: none
Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Semidesert Sand (Fourwing Saltbush)
Ecological site number: R035XY212UT

Figure 83.—Landscape of Mido component in map unit 126 (Rizno-Arches-Mido complex, 2 to 15 percent slopes, very rocky).

Present vegetation (in most areas): sand sagebrush, Indian ricegrass, sand dropseed, purple threeawn

Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 627,971 meters E, 4281,658 meters N, zone 12.

A—0 to 6.5 inches (0 to 17 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 2 percent clay; weak medium and moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, medium, and very coarse roots throughout; common very fine irregular and medium tubular pores; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C1—6.5 to 23 inches (17 to 58 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 1 percent clay; moderate medium and moderate fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine, fine, medium, and very coarse roots throughout; common very fine and fine irregular, and medium tubular pores; very slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—23 to 45.5 inches (58 to 116 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 1 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common fine and medium roots throughout; common very fine and fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

C3—45.5 to 73 inches (116 to 185 cm); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6), moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; common fine roots throughout; common very fine and fine interstitial pores; very slightly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon
Value: 5 or 6 dry, 4 moist
Clay content: 1 to 5 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: none
Reaction: slightly alkaline or moderately alkaline (7.4 to 8.4)

C horizon
Value: 5 or 6 dry, 4 moist
Clay content: 1 to 5 percent
Calcium carbonate equivalent: 1 to 5 percent
Rock fragments: none

127—Pocum family, 2 to 8 percent slopes

Map Unit Setting

General setting: Mesas in Arches National Park
Elevation: 4,680 to 5,310 feet (1,425 to 1,619 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Pocum family and similar soils: 95 percent
Minor components:
- Eroded areas with no vegetation (exposed petrocalcic material)
- Crosscan family soils–Semidesert Shallow Sandy Loam (Utah Juniper/Blackbrush)

Soil Properties and Qualities

Pocum family soils
Taxonomic classification: Loamy, mixed, superactive, mesic, shallow Calcic Petrocalcids (fig. 84)
Landform: Mesas
Geology: Kayenta Formation (Triassic)
Parent material: eolian sands derived from sandstone
Slope: 2 to 8 percent, southeast to northwest aspects

Ground Cover:	(% Cover)
Plant Canopy:	30-40
Litter <5mm:	1-5
Rock Fragments:	10-20
Bare Soil:	20-40
Cyanobacteria Crust:	10-15
Lichen Crust:	0-5
Moss Crust:	10-15
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 12 to 20 inches to petrocalcic; 16 to 28 inches to bedrock, lithic

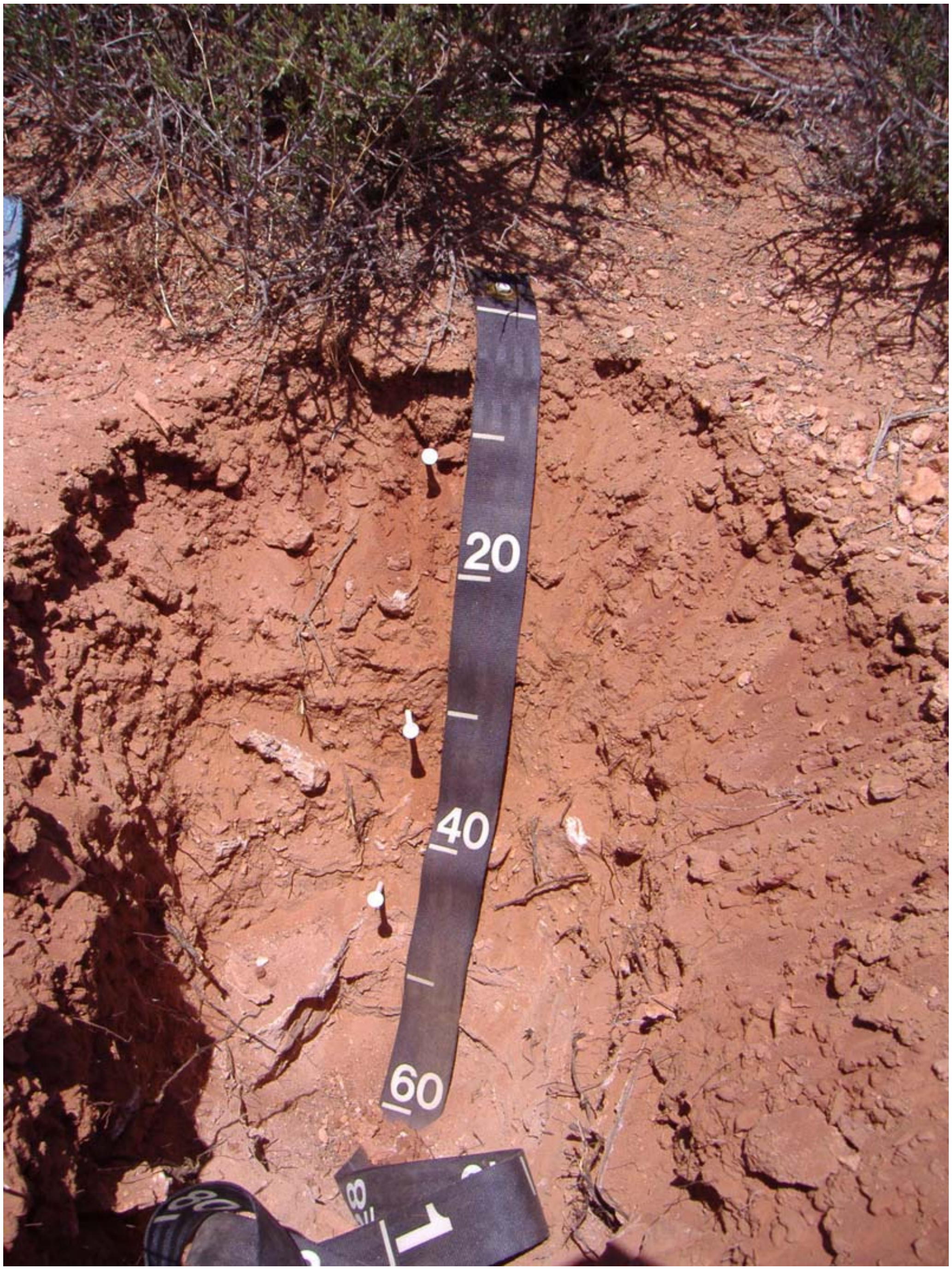

Figure 84.—Profile of Pocum family soil in map unit 127. Petrocalcic contact is at 45 centimeters, lithic contact is at 62 centimeters. Scale is in centimeters.

Drainage class: well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity total inches: about 2.0 (very low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none

Seasonal water table minimum depth: greater than 60 inches
Runoff class: low
Hydrologic group: D
Calcium carbonate equivalent maximum: about 35 percent
Gypsum maximum: none
Salinity maximum: about 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sandy Loam (Blackbrush)
Ecological site number: R035XY233UT
Present vegetation (in most areas): blackbrush, green Mormon tea
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 625,367 meters E, 4286,550 meters N, zone 12.

A—0 to 4.5 inches (0 to 11 cm); reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 4/6), moist; 7 percent clay; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine and common fine irregular pores; 7 percent gravel; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.
Bk—4.5 to 17.5 inches (11 to 45 cm); (5YR 4/8) gravelly fine sandy loam, reddish yellow (5YR 6/6), moist; 15 percent clay; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many very fine and common fine roots throughout; common very fine and fine tubular pores; common medium irregular carbonate masses in matrix; 30 percent gravel; violently effervescent, 25 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt smooth boundary.
Bkm—17.5 to 23 inches (45 to 58 cm); extremely hard; strongly cemented; few fine roots in cracks; violently effervescent, 70 percent calcium carbonate equivalent; very abrupt smooth boundary.
2R—23 inches (58 cm); hard Kayenta Formation sandstone bedrock.

Range in Characteristics

Pocum family soils have bedrock immediately below the petrocalcic, while the original series is greater than 40 inches to bedrock.

A horizon
Hue: 5YR, 7.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 6 or 8 dry, 6 or 7 moist
Texture: loamy fine sand, very fine sandy loam
Clay content: 5 to 15 percent
Calcium carbonate equivalent: 5 to 10 percent
Rock fragments: 5 to 30 percent gravel and petrocalcic fragments

Bk horizon
Value: 4 to 6, dry or moist
Chroma: 6 or 8 dry, 6 moist
Texture: fine sandy loam, sandy loam
Clay content: 10 to 18 percent
Calcium carbonate equivalent: 15 to 35 percent
Rock fragments: 5 to 35 percent gravel and petrocalcic fragments

Bkm horizon:
Calcium carbonate equivalent: 40 to 75 percent
Cemented by: calcium carbonate
Hardness: strongly cemented to indurated

129—Milok very gravelly sandy loam, 2 to 15 percent slopes, eroded

Map Unit Setting

General setting: Hills in Salt Valley, Arches National Park
Elevation: 4,270 to 5,020 feet (1,301 to 1,531 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Milok and similar soils: 75 percent
Minor components:
- Mido soils–Semidesert Sand (Blackbrush)

Soil Properties and Qualities

Milok soils
Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids (fig. 85)
Landform: Hills (fig. 86)
Geology: Gravel Deposits (Quaternary)
Parent material: alluvium derived from sandstone
Slope: 2 to 15 percent, west to east aspects

Ground Cover:	(% Cover)
Plant Canopy:	40-50
Litter <5mm:	1-5
Rock Fragments:	20-35
Bare Soil:	5-20
Cyanobacteria Crust:	30-40
Lichen Crust:	0-5
Moss Crust:	0-5
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): greater than 60 inches
Drainage class: well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity total inches: about 4.9 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: low
Hydrologic group: A
Calcium carbonate equivalent maximum: about 30 percent
Gypsum maximum: none

Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Blackbrush)
Ecological site number: R035XY218UT
Present vegetation (in most areas): blackbrush, green Mormon tea, galleta, Cutler Mormon tea, Indian ricegrass
Land capability (non irrigated): 7e

Figure 85.—Profile of Milok soil in map unit 129. Calcic horizon begins at 25 centimeters.

Figure 86.—Landscape of map unit 129 (Milok very gravelly sandy loam, 2 to 15 percent slopes, eroded).

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 620,443 meters E, 4290,371 meters N, zone 12.

A—0 to 1 inch (0 to 3 cm); yellowish red (5YR 5/6) very gravelly sandy loam, yellowish red (5YR 4/6), moist; 11 percent clay; weak medium granular and weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine roots throughout; common very fine and fine irregular pores; 50 percent gravel; violently effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Bk1—1 inch to 6.5 inches (3 to 17 cm); light reddish brown (5YR 6/4) very gravelly sandy loam, yellowish red (5YR 5/6), moist; 13 percent clay; weak medium subangular blocky parting to moderate thin platy structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots throughout; common very fine and fine irregular pores; many medium irregular carbonate masses in matrix; 35 percent gravel and 5 percent cobbles; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bk2—6.5 to 19 inches (17 to 48 cm); yellowish red (5YR 5/6) gravelly sandy loam, yellowish red (5YR 4/6), moist; 12 percent clay; moderate medium subangular blocky structure; hard, very firm, slightly sticky and nonplastic; few very fine and fine roots throughout; common very fine and fine tubular pores; many medium irregular carbonate masses in matrix; 20 percent gravel and 5 percent cobbles; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bk3—19 to 51 inches (48 to 130 cm); yellowish red (5YR 5/6) gravelly loamy sand, yellowish red (5YR 4/6), moist; 6 percent clay; moderate fine subangular blocky

structure; slightly hard, friable, slightly sticky and nonplastic; common very fine, fine, and medium roots throughout; common very fine irregular and fine tubular pores; common medium irregular carbonate masses in matrix; 30 percent gravel; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C—51 to 78.5 inches (130 to 200 cm); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6), moist; 3 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots throughout; common very fine and fine irregular pores; 10 percent gravel; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Milok soils have more rock fragments throughout the profile than the official series. This soil is assumed to have been truncated, and the original surface is missing.

A horizon
- Value: 4 or 5 dry, 4 moist
- Chroma: 4 or 6 dry, 6 moist
- Texture: sandy loam, fine sandy loam, very fine sandy loam
- Clay content: 10 to 18 percent
- Calcium carbonate equivalent: 10 to 15 percent
- Rock fragments: 15 to 50 percent gravel

Bk horizon
- Hue: 5YR, 7.5YR
- Value: 4 to 6 dry, 4 or 5 moist
- Chroma: 4 or 6, dry or moist
- Texture: sandy loam, very fine sandy loam, loamy sand
- Clay content: 6 to 18 percent (particle-size control section averages coarse-loamy)
- Calcium carbonate equivalent: 15 to 30 percent
- Rock fragments: 5 to 40 percent gravel and cobbles (averages less than 35 percent)

C horizon
- Hue: 5YR, 7.5YR
- Value: 4 or 6 dry, 4 moist
- Texture: sand, loamy sand
- Clay content: 3 to 10 percent
- Calcium carbonate equivalent: 5 to 10 percent
- Rock fragments: 10 to 30 percent gravel

132—Livan family, 0 to 6 percent slopes

Map Unit Setting

General setting: Drainageways throughout Arches National Park
Elevation: 4,010 to 4,760 feet (1,222 to 1,451 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Livan family and similar soils: 85 percent

Minor components:
- Loamy soils deeper than 20 inches–Semidesert Sandy Loam (Blackbrush)

Soil Properties and Qualities

Livan family soils
Taxonomic classification: Sandy-skeletal, mixed, mesic Ustic Torrifluvents (fig. 87, 88)
Landform: Low terraces, drainageways
Geology: Alluvial Deposits (Quaternary)
Parent material: alluvium derived from sandstone
Slope: 0 to 6 percent, northeast to southeast aspects

Ground Cover:	(% Cover)
Plant Canopy:	30-40
Litter <5mm:	15-20
Rock Fragments:	0
Bare Soil:	25-40
Cyanobacteria Crust:	20-30
Lichen Crust:	10-20
Moss Crust:	0-5
Salt Crust:	0
Gypsum Crust:	0

Figure 87.—Profile of Livan family soil in map unit 132. Scale is in centimeters on left, inches on right.

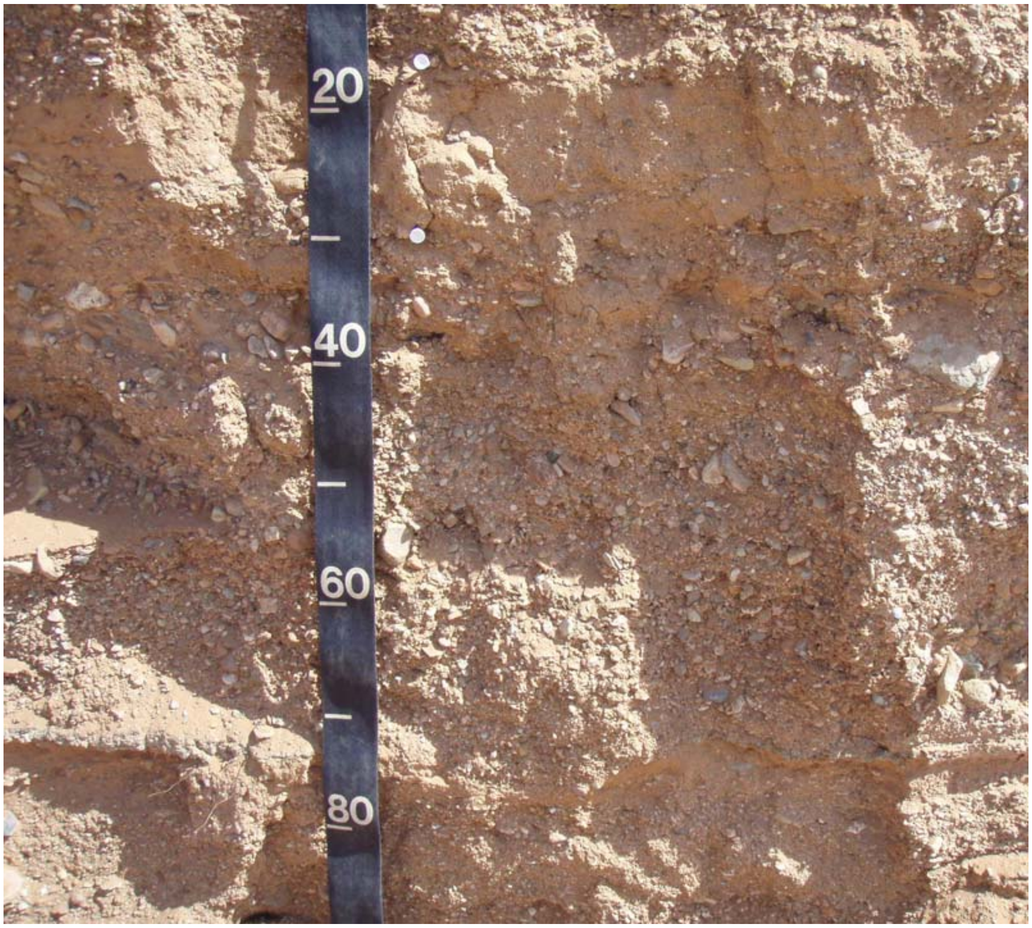

Figure 88.—Close-up of a profile of Livan family soil in map unit 132. The parent material of this soil is alluvium, as evidenced by the stratification visible in this image. Scale is in centimeters.

Depth to restrictive feature(s): greater than 60 inches
Drainage class: excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity total inches: about 4.6 (low)
Shrink-swell potential: about 1.5 LEP (low)
Flooding hazard: occasional, very brief
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches
Runoff class: negligible
Hydrologic group: A
Calcium carbonate equivalent maximum: about 20 percent
Gypsum maximum: none
Salinity maximum: about 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Sandy Bottom (Fourwing Saltbush)
Ecological site number: R035XY015UT
Present vegetation (in most areas): blue grama, prickly Russian thistle, sand sagebrush, fourwing saltbush, scarlet globemallow
Land capability (non irrigated): 6s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 621,259 meters E, 4274,631 meters N, zone 12.

AC—0 to 6 inches (0 to 15 cm); red (2.5YR 4/6) fine sand, dark reddish brown (2.5YR 3/4), moist; 2 percent clay; moderate thick parting to moderate thin platy structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots throughout; many very fine and common fine vesicular pores; 1 percent gravel; slightly effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear wavy boundary.

C1—6 to 27 inches (15 to 68 cm); red (2.5YR 4/6) sand, dark red (2.5YR 3/6), moist; 2 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine, and common fine and medium roots throughout; many very fine and few fine irregular pores; 6 percent gravel; slightly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

C2—27 to 28.5 inches (68 to 72 cm); red (2.5YR 4/6) very gravelly coarse sand, dark red (2.5YR 3/6), moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; common very fine and few fine roots throughout; many very fine and few fine interstitial pores; 55 percent gravel; slightly effervescent, 18 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; abrupt wavy boundary.

C3—28.5 to 35 inches (72 to 89 cm); red (2.5YR 4/6) extremely gravelly coarse sand, dark red (2.5YR 3/6), moist; 1 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots throughout, and common coarse roots at top of horizon; many very fine and few fine irregular pores; 80 percent fine gravel; slightly effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C4—35 to 49 inches (89 to 124 cm); red (2.5YR 4/6) extremely gravelly coarse sand, dark red (2.5YR 3/6), moist; 1 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; few very fine, fine, and medium roots throughout; many very fine and few fine irregular pores; 60 percent gravel and 10 percent cobbles; strongly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C5—49 to 78.5 inches (124 to 200 cm); red (2.5YR 4/6) extremely gravelly loamy coarse sand, dark red (2.5YR 3/6), moist; 5 percent clay; massive; hard, very firm, slightly sticky and nonplastic; few fine and medium roots throughout; many very fine and common fine irregular pores; 60 percent gravel, 5 percent cobbles, and 5 percent stones; slightly effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Range in Characteristics

This soil is mapped at the family level because of the wide range in sand sizes and coarse fragment content, and because the Livan series reflects the soil forming processes of the Great Plains.

C horizons

Hue: 2.5YR, 5YR
Value: 4 or 5 dry, 3 or 4 moist
Chroma: 3 or 6 dry, 4 or 6 moist
Texture: coarse sand, sand, fine sand, very fine sand, loamy very fine sand, loamy coarse sand
Clay content: 1 to 10 percent
Calcium carbonate equivalent: 1 to 20 percent

Rock fragments: 0 to 80 percent gravel (particle-size control section averages greater than 35 percent)

133—Chedeski family, 15 to 60 percent slopes

Map Unit Setting

General setting: Margins of Cache Valley, Salt Valley, and in canyons throughout Arches National Park
Elevation: 3,960 to 5,250 feet (1,207 to 1,601 meters)
Mean annual precipitation: 9 to 11 inches (229 to 279 millimeters)
Mean annual air temperature: 53 to 57 degrees F (11.7 to 13.9 degrees C)
Mean annual soil temperature: 55 to 58 degrees F (12.8 to 15.0 degrees C)
Frost-free period: 170 to 200 days
Major Land Resource Area: 35–Colorado Plateau

Map Unit Composition

Chedeski family and similar soils: 90 percent
Minor components:
- Rock outcrop, Wingate and Kayenta Formations (Sandstone)

(The rock outcrop component is characterized by many cliffs and escarpments with very steep colluvial and talus slopes. The vertical relief of the cliffs is from a few feet to several tens of feet and varies from broken to nearly continuous, especially at the upper part of the map unit. In some areas, the proportion of rock outcrop exceeds 25 percent.)

Soil Properties and Qualities

Chedeski family soils
Taxonomic classification: Loamy, mixed, superactive, mesic, shallow Ustic Haplocambids (fig. 89)
Landform: Scarp slopes of cuestas and canyon walls
Geology: Chinle, Wingate, and Kayenta Formations (Triassic)
Parent material: colluvium derived from sandstone
Slope: 15 to 60 percent, north aspect

Ground Cover:	(% Cover)
Plant Canopy:	25-35
Litter <5mm:	2-5
Rock Fragments:	45-60
Bare Soil:	5-20
Cyanobacteria Crust:	0-5
Lichen Crust:	0-5
Moss Crust:	0-5
Salt Crust:	0
Gypsum Crust:	0

Depth to restrictive feature(s): 10 to 20 inches to bedrock, paralithic
Drainage class: well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity total inches: about 2.2 (very low)
Shrink-swell potential: about 4.5 LEP (moderate)
Flooding hazard: none
Ponding hazard: none
Seasonal water table minimum depth: greater than 60 inches

Runoff class: very high
Hydrologic group: D
Calcium carbonate equivalent maximum: about 10 percent
Gypsum maximum: none
Salinity maximum: about 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (SAR) maximum: about 0 SAR (nonsodic)
Ecological site name: Semidesert Steep Shallow Loam (Utah Juniper-Pinyon)

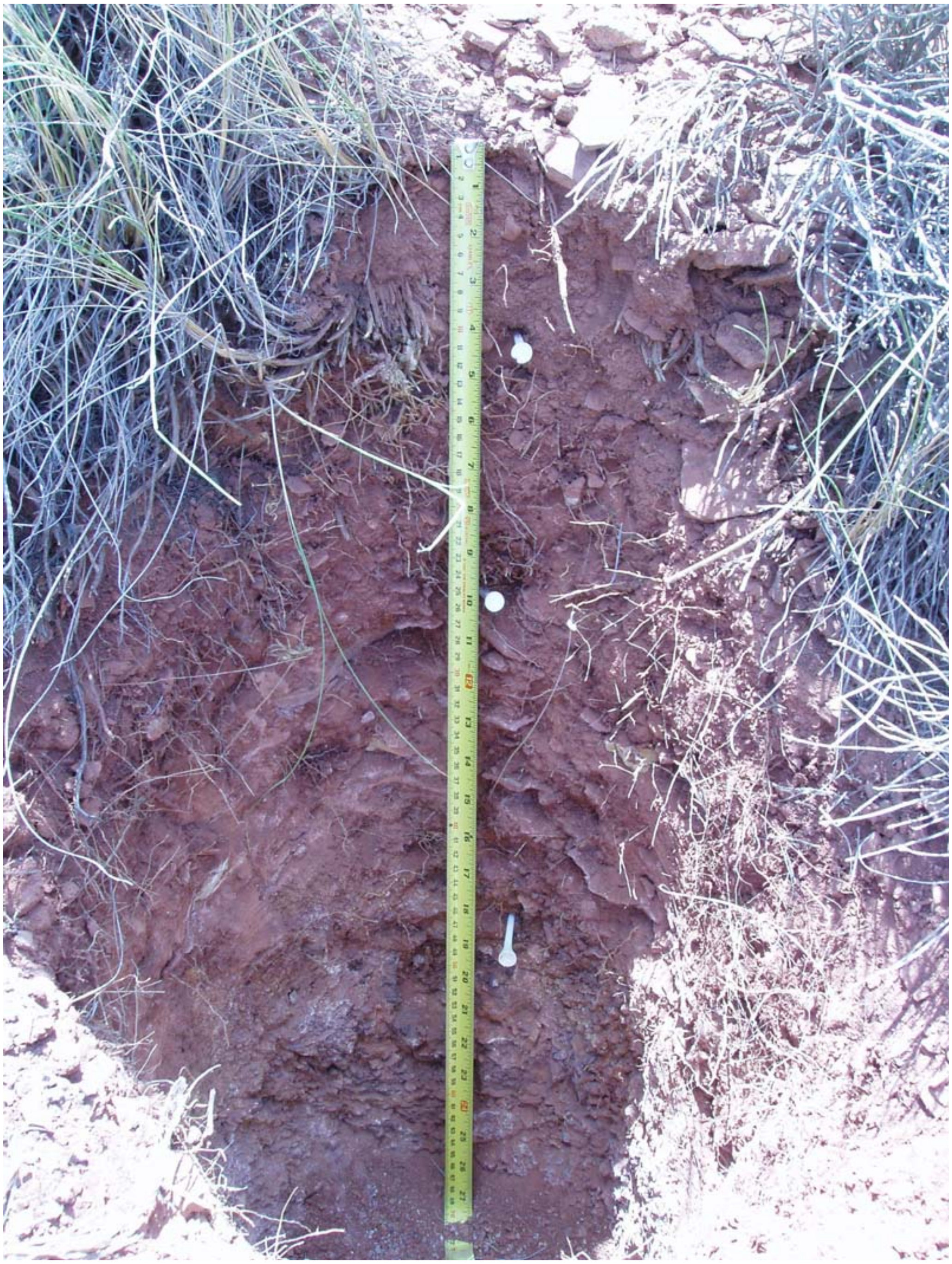

Figure 89.—Profile of Chedeski family soil in map unit 133. Paralithic contact is at 19 centimeters. Scale is in centimeters on left, inches on right.

Ecological site number: R035XY240UT
Present vegetation (in most areas): blackbrush, Salina wildrye, skunkbush sumac, Utah serviceberry, Torrey Mormon tea, Utah juniper, galleta
Land capability (non irrigated): 7s

Typical Profile

Location

Geographic Coordinate System (Universal Transverse Mercator): 630,296 meters E, 4287,551 meters N, zone 12.

A—0 to 4.5 inches (0 to 11 cm); red (2.5YR 5/6) gravelly sandy clay loam, red (2.5YR 4/8), moist; 22 percent clay; moderate fine granular and very fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine, medium, and coarse roots throughout; many very fine and common fine irregular pores; 30 percent gravel; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk1—4.5 to 10 inches (11 to 26 cm); red (2.5YR 5/8) very gravelly sandy clay loam, red (2.5YR 4/8), moist; 33 percent clay; moderate fine and medium subangular blocky structure; slightly hard, very friable, moderately sticky and slightly plastic; common very fine, fine, and medium roots throughout; common very fine and fine irregular, and common medium tubular pores; carbonate, finely disseminated throughout and few fine irregular carbonate masses in matrix; 35 percent gravel; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk2—10 to 19 inches (26 to 48 cm); red (2.5YR 5/6) gravelly sandy clay loam, red (2.5YR 4/6), moist; 27 percent clay; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and medium roots throughout; many very fine and common fine tubular pores; common medium irregular carbonate masses in matrix; 10 percent gravel and 5 percent channers; slightly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; clear smooth boundary.

2Cr—19 to 60 inches (48 to 152 cm); soft calcareous Chinle Formation sandstone bedrock.

Range in Characteristics

Chedeski family soils have carbonates, more than 15 percent rock fragments throughout, and are not underlain by hard bedrock, in contrast with the official series.

A horizon
- Hue: 2.5YR, 5YR
- Chroma: 4 or 6 dry, 4 to 8 moist
- Texture: sandy clay loam, fine sandy loam, sandy loam
- Clay content: 10 to 27 percent
- Calcium carbonate equivalent: 5 to 10 percent
- Rock fragments: 15 to 40 percent gravel or channers

Bk or Bw horizons (where present)
- Hue: 2.5YR, 5YR
- Value: 4 or 5 dry, 3 or 4 moist
- Chroma: 4 to 8, dry or moist
- Texture: sandy clay loam, fine sandy loam
- Clay content: 18 to 35 percent
- Calcium carbonate equivalent: 5 to 10 percent
- Rock fragments: 15 to 40 percent gravel, channers, and stones (particle-size control section averages less than 35 percent)

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and forestland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and as wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Interpretive Ratings

The interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations. The ratings in these tables are both verbal and numerical.

Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited, somewhat limited,* and *very limited*. The suitability ratings are expressed as *well suited, moderately suited, poorly suited,* and *unsuited* or as *good, fair,* and *poor*.

Numerical Ratings

Numerical ratings in the tables indicate the relative severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation. The limitations appear in order from the most limiting to the least limiting. Thus, if more than one

limitation is identified, the most severe limitation is listed first and the least severe one is listed last.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

There are no soils in Arches National Park that meet the criteria for Prime Farmland as defined by the U.S Department of Agriculture. Some of the reasons for disqualification are: excessive coarse fragments, high susceptibility to wind erosion, excessive slope, low available water capacity, excessive wetness, and excessive salts. Each soil identified in Arches National Park does not meet the requirements for Prime Farmland due to one or more of the above reasons.

Rangeland and Woodland Understory Vegetation

Areas that have similar climate and topography, differences in the kind and amount of rangeland or forest understory vegetation are closely related to the soil. Effective management is based on the relationship between the soils, vegetation, and water. Rangeland is typically defined as a type of land that supports vegetation suitable for grazing (grasses, forbs, and shrubs) and is managed by ecological, rather than agronomic methods. However, for this survey, the term rangeland is used loosely to describe all land that produces any type of vegetation and is managed by ecological rather than agronomic methods. Therefore all soil components that support vegetation are assigned an ecological site which details the relationship between the soils, vegetation, and water.

Table 6 includes map unit and details for each soil component, including the ecological site, existing vegetation at the time the survey, estimated total annual production of the existing vegetation in favorable, normal, and unfavorable years, and typical percentage of dominant species measured by annual production.

Landscapes are divided into ecological sites for the purposes of inventory, evaluation, and management. An ecological site is a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. An ecological site is the product of all environmental factors responsible for its development. It has characteristic soils that developed over time including characteristic hydrology. Hydrology is influenced

by soil and plant community development and typically describes infiltration and permeability rates. The vegetation, soils, and hydrology are interrelated and influenced each other. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production. The ecological site description contains details about the characteristic soils, plant community, different steady states that are expected, possible transitions, and site interpretations. For a full ecological site description that includes a state and transition model, refer to the Natural Resources Conservation Service's Ecological Site and Information System at http://esis.sc.egov.usda.gov. You may also refer to the Ecological Site Description Report for Arches National Park.

Total dry-weight production is the amount of vegetation that can be expected to grow annually in a well managed area that supports the existing plant community at the time of the survey. It includes all current year's vegetative growth of leaves, twigs, flowers, and fruits, whether or not it is palatable to grazing animals. It does not include the increase in stem diameter of trees and shrubs. Estimated total annual production values, in pounds per acre of air-dry vegetation, is given for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Yields are adjusted to a common percent of air-dry moisture content.

Characteristic vegetation—this column reports the dominant grasses, forbs, shrubs and trees by annual production of the existing plant community at the time of the survey. Tables 7 and 8 show the common plants in the survey area. Table 7 lists plants by scientific name, and table 8 lists plants by common name.

Composition—this column gives the typical percentage of the total annual production for the dominant species of the existing vegetation. The amount that can be used as forage depends on the grazing animals and grazing season.

Information about rangeland management including range similarity index and rangeland trend is available in chapter 4 of the “National Range and Pasture Handbook” available on the Internet at http://www.glti.nrcs.usda.gov/technical/publications/nrph.html.

The native rangeland and forest understory ecological sites are described in the paragraphs that follow.

Figure 90.—R035XY009UT – Alkali Flat (Greasewood)

This ecological site occurs on high stream terraces where flooding is very rare. Soils are very deep and loamy and have a water table deeper than 6 feet. Slopes range from 0 to 6 percent. Typical native plant species include greasewood *(Sarcobatus vermiculatus var. vermiculatus)*, seepweed *(Suaeda spp.)*, galleta *(Pleuraphis jamesii)*, shadscale saltbush *(Atriplex confertifolia)*, and Indian ricegrass *(Achnatherum hymenoides)*.

Figure 91.—R035XY011UT – Loamy Bottom (Basin Big Sagebrush)

This ecological site occurs on high flood plain steps that are occasionally flooded. Soils are very deep and excessively drained with a water table deeper than 6 feet. Slopes range from 0 to 6 percent. Typical native plant species include fourwing saltbush *(Atriplex canescens var. occidentalis)*, basin big sagebrush *(Artemisia tridentate)*, Fremont cottonwood *(Populus fremontii)*, sumac *(Rhus aromatica var trilobata)*, and Indian ricegrass *(Achnatherum hymenoides)*.

Figure 92.—R035XY013UT – Semiwet Fresh Streambank (Fremont Cottonwood)

This ecological site occurs on flood plain steps which are frequently flooded. Soils are very deep and moderately well drained, with a seasonal water table below 20 inches. Slopes range from 0 to 3 percent. Typical native plant species include Fremont cottonwood *(Populus fremontii)*, coyote willow *(Salix exigua ssp. exigua var. stenophylla)*, and inland saltgrass *(Distichlis sp.)*.

Figure 93.—R035XY015UT – Sandy Bottom (Fourwing Saltbush)

This ecological site occurs on low terraces and in drainageways. Soils are very deep and excessively drained, and flooding is rare. Slopes range from 0 to 6 percent. Typical native plant species include blue grama *(Bouteloua gracillis)*, sand sagebrush *(Artemisia filifolia)*, fourwing saltbush *(Atriplex canescens var. occidentalis)*, and scarlet globemallow *(Sphaeralcea coccinea)*.

Figure 94.—R035XY019UT – Shallow Sand Rock Pocket (Utah Juniper-Pinyon)

This ecological site occurs in areas that have a high percentage of rock outcrop on mesas and cuestas. Soils are generally sandy and shallow to sandstone bedrock. Slopes range from 2 to 30 percent. Typical native plant species include littleleaf mountain-mahogany *(Cercocarpus intricatus)*, Stansbury cliffrose *(Purshia mexicana var. stansburyana)*, Havard oak *(Quercus harardii)*, Utah juniper *(Juniperus osteosperma)*, twoneedle pinyon *(Pinus edulis)*, sumac *(Rhus aromatica var trilobata)*, Bigelow sagebrush *(Artemisia bigelovi)*, singleleaf ash *(Fraxinus anomala)*, galleta *(Pleuraphis jamesii)*, and Indian ricegrass *(Achnatherum hymenoides)*.

Figure 95.—R035XY103UT – Desert Clay (Castle Valley Saltbush)

This ecological site occurs on dry hills. Soils are shallow to shale bedrock, moderately saline and slightly sodic. Slopes range from 2 to 45 percent. Runoff is very high, and erosion rills are common. Typical native plant species include castle valley saltbush *(Atriplex gardneri var. cuneata)*, bud sagebrush *(Picrothamnus desertorum)*, desert trumpet buckwheat *(Eriogonum inflatum)*, and mat saltbush *(Atriplex corrugate)*.

Figure 96.—R035XY124UT – Desert Shallow Clay (Mat Saltbush)

This ecological site occurs on dry hills. Soils are shallow to shale bedrock, strongly saline and strongly sodic. Slopes range from 2 to 45 percent. Runoff is very high, and erosion rills are common. Typical native plant species include mat saltbush *(Atriplex corrugate)*, castle valley saltbush *(Atriplex gardneri var. cuneata)*, galleta *(Pleuraphis jamesii)*, and Indian ricegrass *(Achnatherum hymenoides)*.

Figure 97.—R035XY130UT – Desert Shallow Sandy Loam (Shadscale)

This ecological site occurs on dry hills. Soils are shallow to shale bedrock, moderately saline and slightly sodic. Slopes range from 15 to 70 percent. Runoff is very high, and erosion rills are common. Typical native plant species include shadscale saltbush *(Atriplex confertifolia)*, bud sagebrush *(Picrothamnus desertorum)*, desert trumpet buckwheat *(Eriogonum inflatum)*, and mat saltbush *(Atriplex corrugate)*.

Figure 98.—R035XY133UT – Desert Shallow Sandy Loam (Blackbrush)

This ecological site occurs on dipslopes of cuestas. Soils are shallow to sandstone bedrock. Slopes range from 15 to 35 percent. Typical native plant species include blackbrush *(Coleogyne ramosissima)*, shadscale saltbush *(Atriplex confertifolia)*, galleta *(Pleuraphis jamesii)*, Indian ricegrass *(Achnatherum hymenoides)*, and Utah juniper *(Juniperus osteosperma)*.

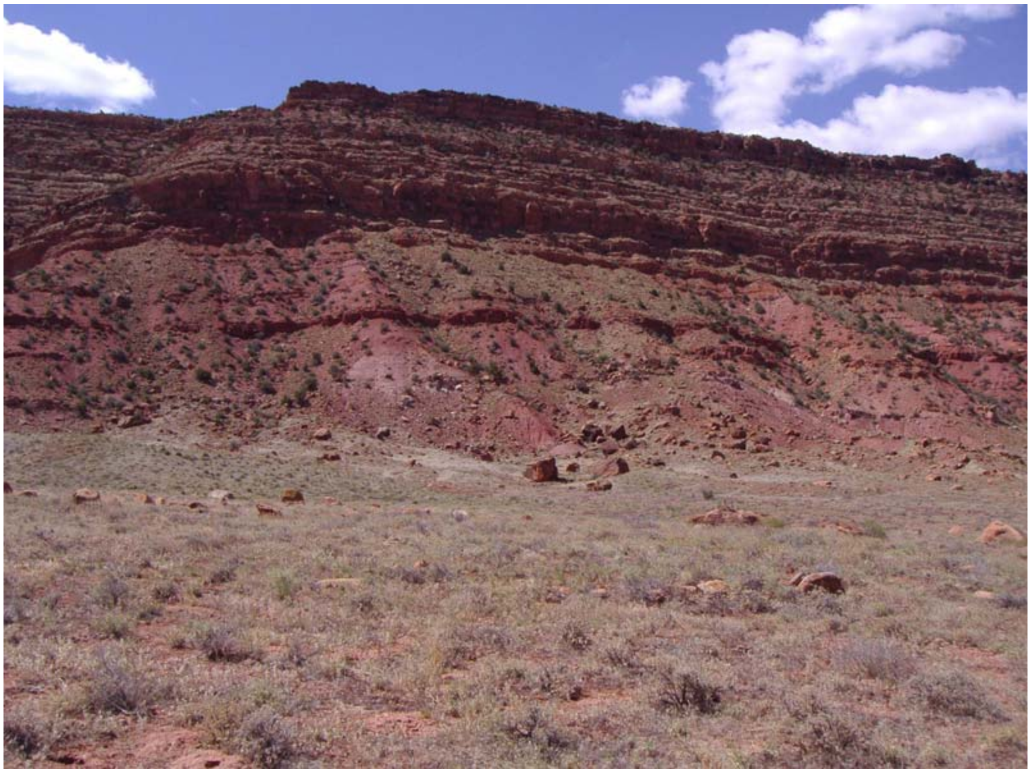

Figure 99.—R035XY136UT – Desert Stony Loam (Shadscale-Budsage)

This ecological site occurs on fan remnants at the toeslopes of cuesta scarps. Soils are very deep and loamy, with common stones and boulders at the surface. Slopes range from 1 to 6 percent. Typical native plant species include bud sagebrush *(Picrothamnus desertorum)*, galleta *(Pleuraphis jamesii)*, Indian ricegrass *(Achnatherum hymenoides)*, and shadscale saltbush *(Atriplex confertifolia)*.

Figure 100.—R035XY210UT – Semidesert Sand (Blackbrush)

This ecological site occurs on sand deposits, mostly on interdune areas, but also on small dunes. Soils are very deep and have low available water capacity. Slopes range from 2 to 15 percent. Typical native plant species include blackbrush *(Coleogyne ramosissima)*, sand sagebrush *(Artemisia filifolia)*, jointfir species *(Ephedra spp.)*, galleta *(Pleuraphis jamesii)*, plains pricklypear *(Opuntia polyacantha)*, and Indian ricegrass *(Achnatherum hymenoides)*.

Figure 101.—R035XY211UT – Semidesert Sand (Dune)

This ecological site occurs on active sand dunes. Soils are very deep and have low available water capacity. Slopes range from 5 to 30 percent. Typical native plant species include rosemary mint *(Poliomintha incana)*, Resinbush *(Vanclevia stylosa)*, Indian ricegrass *(Achnatherum hymenoides)*, and sand sagebrush *(Artemisia filifolia)*.

Figure 102.—R035XY212UT – Semidesert Sand (Fourwing Saltbush)

This ecological site occurs on sand sheets and stabilized dunes. Soils are very deep. Slopes range from 5 to 15 percent. Typical native plant species include Cutler Mormon tea *(Ephedra cutleri)*, winterfat *(Karscheninnikovia lanata var. lanata)*, Indian ricegrass *(Achnatherum hymenoides)*, fourwing saltbush *(Atriplex canescens var. occidentalis)*, galleta *(Pleuraphis jamesii)*, needleandthread *(Hesperostipa comata var. comata)*, plains pricklypear *(Opuntia polyacantha)*, sand sagebrush *(Artemisia filifolia)*, and sand dropseed *(Sporobolus cryptandrus)*.

Figure 103.—R035XY215UT – Semidesert Sandy Loam (Fourwing Saltbush)

This ecological site occurs on sand sheets. Soils are very deep, with moderate to high available water capacity. Slopes range from 0 to 6 percent. Typical native plant species include Indian ricegrass *(Achnatherum hymenoides)*, fourwing saltbush *(Atriplex canescens var. occidentalis)*, galleta *(Pleuraphis jamesii)*, and sand dropseed *(Sporobolus cryptandrus)*.

Figure 104.—R035XY218UT – Semidesert Sandy Loam (Blackbrush)

This ecological site occurs on hills, and the soils are very deep with significant calcium carbonate accumulation. Slopes range from 2 to 15 percent. Typical native plant species include blackbrush *(Coleogyne ramosissima)*, green Mormon tea *(Ephedra viridis var. viridis)*, galleta *(Pleuraphis jamesii)*, Cutler Mormon tea *(Ephedra cutleri)*, and Indian ricegrass *(Achnatherum hymenoides)*.

Figure 105.—R035XY233UT – Semidesert Shallow Sandy Loam (Blackbrush)

This ecological site occurs on slightly more sloping parts of the mesa top. Soils are shallow to sandstone or shale bedrock, or to a root-limiting petrocalcic horizon. Slopes range from 2 to 45 percent. Typical native plant species include blackbrush *(Coleogyne ramosissima)*, green Mormon tea *(Ephedra viridis var. viridis)*, Cutler Mormon tea *(Ephedra cutleri)*, Torrey Mormon tea *(Ephedra torreyana)*, shadscale saltbush *(Atriplex confertifolia)*, plains pricklypear *(Opuntia polyacantha)*, and galleta *(Pleuraphis jamesii)*.

Figure 106.—R035XY236UT – Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon)

This ecological site occurs on hills, structural benches, dunes, ledges, and cuestas. Soils are generally shallow to sandstone or shale bedrock. Slopes range from 2 to 30 percent. Typical native plant species include Utah juniper *(Juniperus osteosperma)*, blackbrush *(Coleogyne ramosissima)*, green Mormon tea *(Ephedra viridis var. viridis)*, twoneedle pine *(Pinus edulis)*, Havard’s oak *(Quercus harardii)*, and broom snakeweed *(Gutierrezia sarothrae)*.

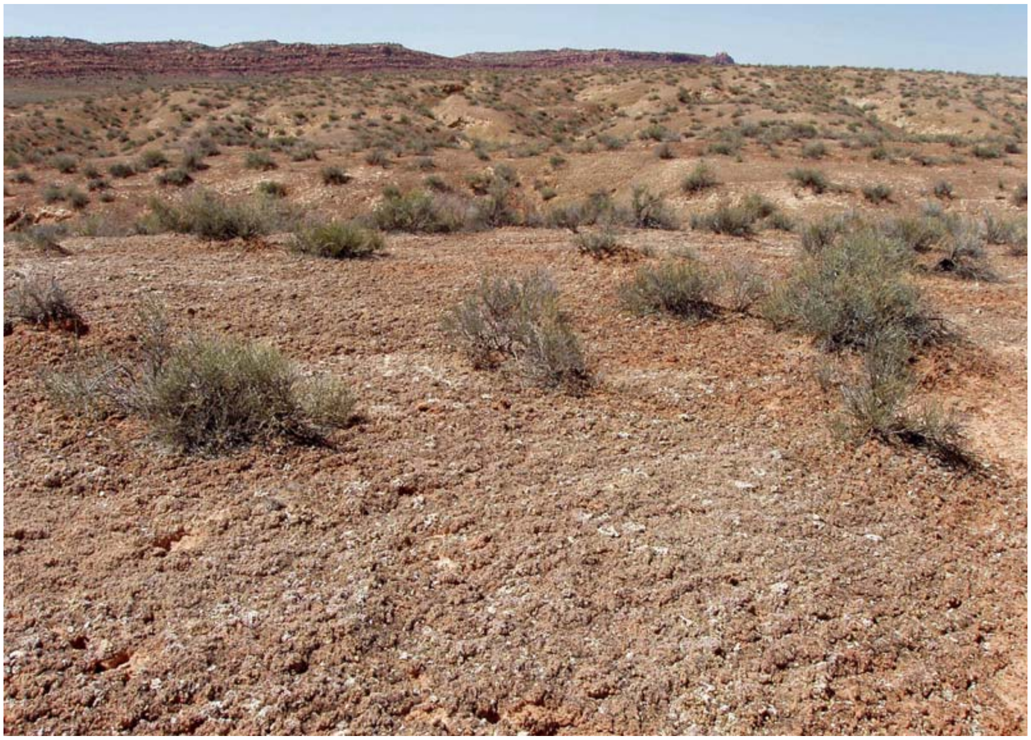

Figure 107.—R035XY237UT – Semidesert Shallow Gypsum (Mormontea)

This ecological site occurs on hills. Soils are shallow to gypsum bedrock, and contain significant amounts of pedogenic gypsum. Slopes range from 2 to 15 percent. Typical native plant species include Torrey Mormon tea *(Ephedra torreyana)*, fourwing saltbush *(Atriplex canescens var. occidentalis)*, Desert Princesplume *(Stanleya pinnata)*, Jones's pepperweed *(Lepidium montanum var. jonesii)*, and galleta *(Pleuraphis jamesii)*.

Figure 108.—R035XY240UT – Semidesert Steep Shallow Loam (Utah Juniper)

This ecological site occurs on scarp slopes. Soils are shallow to shale bedrock. Slopes range from 15 to 60 percent. Typical native plant species include blackbrush *(Coleogyne ramosissima)*, Salina wildrye *(Leymus salinus)*, skunkbush sumac *(Rhus aromatica var trilobata)*, Utah serviceberry *(Amelanchier utahensis)*, Torrey Mormon tea *(Ephedra torreyana)*, Utah juniper *(Juniperus osteosperma)*, and galleta *(Pleuraphis jamesii)*.

Land Management

In tables 9 through 12, interpretive ratings are given for various aspects of land management. The ratings are both verbal and numerical.

Some rating class terms indicate the degree to which the soils are suited to a specified land management practice. *Well suited* indicates that the soil has features that are favorable for the specified practice and has no limitations. Good performance can be expected, and little or no maintenance is needed. *Moderately suited* indicates that the soil has features that are moderately favorable for the specified practice. One or more soil properties are less than desirable, and fair performance can be expected. Some maintenance is needed. *Poorly suited* indicates that the soil has one or more properties that are unfavorable for the specified practice. Overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration. *Unsuited* indicates that the expected performance of the soil is unacceptable for the specified practice or that extreme measures are needed to overcome the undesirable soil properties.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified forest management practice (1.00) and the point at which the soil feature is not a limitation (0.00).

Rating class terms for fire damage and seedling mortality are expressed as *low, moderate,* and *high*. Where these terms are used, the numerical ratings indicate gradations between the point at which the potential for fire damage or seedling mortality is highest (1.00) and the point at which the potential is lowest (0.00).

The paragraphs that follow indicate the soil properties considered in rating the soils for forest management practices. More detailed information about the criteria used in the ratings is available in the "National Forestry Manual," which is available in local offices of the Natural Resources Conservation Service or on the Internet (http://nsscnt.nssc.nrcs.usda.gov/nfm/).

In table 9, ratings in the columns *suitability for hand planting* and *suitability for mechanical planting* are based on slope, depth to a restrictive layer, content of sand, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, moderately suited, poorly suited, or unsuited to these methods of planting. It is assumed that necessary site preparation is completed before seedlings are planted.

Ratings in the column *soil rutting hazard* are based on depth to a water table, rock fragments on or below the surface, the Unified classification, depth to a restrictive layer, and slope. Ruts form as a result of the operation of forest equipment. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that the soil is subject to little or no rutting, *moderate* indicates that rutting is likely, and *severe* indicates that ruts form readily.

In table 10, ratings in the column *hazard of off-road or off-trail erosion* are based on slope and on soil erodibility factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight, moderate, severe, or very severe. A rating of *slight* indicates that erosion is unlikely under ordinary climatic conditions; *moderate* indicates that some erosion is likely and that erosion-control measures may be needed; *severe* indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and *very severe* indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

Ratings in the column *hazard of erosion on roads and trails* are based on the soil

erodibility factor K, slope, and content of rock fragments. The ratings apply to unsurfaced roads and trails. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that little or no erosion is likely; *moderate* indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and *severe* indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Ratings in the column *suitability for roads (natural surface)* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, ponding, flooding, and the hazard of soil slippage. The ratings indicate the suitability for using the natural surface of the soil for roads. The soils are described as well suited, moderately suited, or poorly suited to this use.

In table 11, ratings in the columns *suitability for mechanical site preparation (surface)* are based on slope, depth to a restrictive layer, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, moderately suited, poorly suited, or unsuited to this mabagement activity. The part of the soil from the surface to a depth of about 1 foot is considered in the ratings.

Ratings in the column *suitability for mechanical site preparation (deep)* are based on slope, depth to a restrictive layer, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, moderately suited, or poorly suited to this management activity. The part of the soil from the surface to a depth of about 3 feet is considered in the ratings.

In table 12, ratings in the column *potential for damage to soil by fire* are based on texture of the surface layer, content of rock fragments and organic matter in the surface layer, thickness of the surface layer, and slope. The soils are described as having a low, moderate, or high potential for this kind of damage. The ratings indicate an evaluation of the potential impact of prescribed fires or wildfires that are intense enough to remove the duff layer and consume organic matter in the surface layer.

Ratings in the column *potential for seedling mortality* are based on flooding, ponding, depth to a water table, content of lime, reaction, salinity, available water capacity, soil moisture regime, soil temperature regime, aspect, and slope. The soils are described as having a low, moderate, or high potential for seedling mortality.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading “Soil Properties.”

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose

specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Recreation

The soils of the survey area are rated in tables 13 and 14 according to limitations that affect their suitability for recreation. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the tables are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are

limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in tables 13 and 14 can be supplemented by other information in this survey, for example, interpretations for building site development, construction materials, sanitary facilities, and water management.

In table 13, *camp areas* require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

In table 14, *foot traffic and equestrian trails* should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Mountain bike and off-road vehicle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer.

Building Site Development

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Tables 15 and 16 show the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the tables are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by

special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

In table 15, *dwellings* are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

In table 16, *local roads and streets* have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may

restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Sanitary Facilities

Table 17 shows the degree and kind of soil limitations that affect septic tank absorption fields and sewage lagoons. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

In table 17, *septic tank absorption fields* are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Groundwater contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and

the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

Construction Materials

Tables 18 and 19 give information about the soils as potential sources of gravel, sand, topsoil, reclamation material, and roadfill. Normal compaction, minor processing, and other standard construction practices are assumed.

In table 18, *sand* and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 18, only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

The soils are rated *good, fair,* or *poor* as potential sources of sand and gravel. A rating of *good* or *fair* means that the source material is likely to be in or below the soil. The bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of sand or gravel. The number 0.00 indicates that the layer is a poor source. The number 1.00 indicates that the layer is a good source. A number between 0.00 and 1.00 indicates the degree to which the layer is a likely source.

The soils are rated *good, fair,* or *poor* as potential sources of topsoil, reclamation material, and roadfill. The features that limit the soils as sources of these materials are specified in the tables. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of topsoil, reclamation material, or roadfill. The lower the number, the greater the limitation.

In table 19, *reclamation material* is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 20 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less

than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

Soil properties are ascertained by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include engineering index properties, physical and chemical properties, and pertinent soil and water features.

Engineering Index Properties

Table 21 gives the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages

are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

Physical Properties

Table 22 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In table 22, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In table 22, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In table 22, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^{1}/_{3}$- or $^{1}/_{10}$-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential,

available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 22, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in table 22 as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of several factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting

their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Table 23 displays estimates of some of the more important values related to soil erodibility. Erosion Factor Kw, Erosion Factor Kf, Erosion Factor T, Wind Erodibility Group, and Wind Erodibility Index are shown for each layer of each soil component.

Chemical Properties

Table 24 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable bases that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in

water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

Table 25 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. Table 25 indicates, by month, depth to the top *(upper limit)* and base *(lower limit)* of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Table 25 indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Soil Features

Table 26 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil, or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial

subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Table 27 shows those map unit characteristics related to soil development or pedogenesis – the climate, landform, geology, parent material, and vegetation. Column headers are as follows: map symbol and soil name, percent of map unit (component composition), slope (range), elevation (range), MAP (mean annual precipitation range), landform, geology, parent material, and ecological site.

Formation of the Soils

The term “soil formation” refers to two processes that occur simultaneously in the environment. The first is the breakdown through physical and chemical weathering of rock (consolidated material that is incapable of sustaining plants) into soil (a loose material capable of sustaining plant life). The second process is the subsequent development of soil horizons within the unconsolidated material, a process called pedogenesis.

Five major factors are recognized as working in concert to influence soil formation: parent material, climate, topography, biological factors, and time (Brady, 2002). The interactions of these five factors result in the wide variety of soils found throughout the world, as well as in any specific study area, such as Arches National Park.

Parent material

Parent material is the unconsolidated material from which soils develop. The interaction of chemical and physical weathering processes with the inherent properties of parent material has a profound effect on the characteristics of the soils that develop. In general, the more arid the climate, the more influence parent material has on soils. In Arches National Park, there are four distinct parent materials involved in the soil formation process: eolian material, alluvium, colluvium, and residuum.

Nearly all of the soils mapped within Arches National Park form in materials that have moved into place from elsewhere; the distances travelled by these materials may be many hundreds of miles or just a few feet. One of the major parent materials of soils in the Park is eolian, or wind-blown, material. This material is composed primarily of fine sand. The eolian soils that develop from this material are the result of episodic deposition over a long period of time; some soil samples collected in nearby Canyonlands National Park have been dated to 46,000 years ago, with depositional events continuing up to the present day in varying degrees of intensity (Reynolds et al., 2006). The eolian soils have characteristics that reflect their origins; most are reddish brown in color, are sandy in texture, and have very few coarse fragments within the soil profile. These eolian soils occur on mesas, cuestas, hills, ledges, and structural benches. They vary in depth from a few inches to many feet.

The second parent material found within the Park is alluvium, or water-deposited material. Alluvial soils are found in the bottoms of canyons and drainageways within the Park. Sediments along these perennial and intermittent waterways have different textures, depending on whether the water moves quickly or slowly. Fast-moving water leaves gravel, rocks, and sand. Slow-moving water leaves fine textured material (clay and silt) when sediments settle out. All of these materials are found within the Park. The floodplain, terrace, and drainageway soils found in the Park are comprised primarily of various sizes of sand, with some finer textures such as silt loams, sandy clay loams, and sandy loams present as well. Water-borne gravels and cobbles can also be found in this alluvium, testament to the occasionally strong torrents of water that move through these drainageways and canyon bottoms.

The third parent material is colluvium, or material transported by gravity. In the Park, colluvium is found on primarily on dipslopes of cuestas, talus slopes, hillslopes, and canyon walls. The soils that develop from colluvium reflect the characteristics of the parent material, usually having many rocks throughout the profiles and on the surface, ranging from gravels to boulders. The textures of the soils depend largely upon the geological origin of the colluvial material. For example, the Moclom family soils are very sandy in nature, reflecting the contribution of the thick sandstone layer in the Salt Wash Member of the Morrison Formation. In the same map unit, the Simel family soils develop from the limestone, shale, and siltstone layers of the Salt Wash Member. Accordingly, the Simel soils have loamy textures that reflect the finer textured materials of the parent material.

Some soils weather directly from the underlying rocks. These “residual” soils have the same general chemistry as the original rocks, and reflect the colors of the parent material as well. An example of this is the Crosscan family soil in map unit 88. This soil is primarily residual, with some colluvial influence in steeper areas of the map unit. The soil is red and loamy, having developed through weathering of the Dewey Bridge Member of the Entrada Formation. This sandstone is reddish-brown and relatively fine-grained, and consists of fine sands and silts. The Retsabal soils in map unit 106 are dominantly residuum formed from the gypsum-rich Paradox formation, although there is typically a few inches of eolian sand skiff at the surface as well. These Retsabal soils are very high in gypsum (up to 70 percent gypsum in the soil material and 100 percent in the soft bedrock), reflecting their origin in the Paradox material.

Climate

Soils vary, depending on the climate. Temperature and moisture amounts cause different patterns of weathering and leaching. Wind redistributes sand and other particles, especially in arid regions. The amount, intensity, timing, and kind of precipitation influence soil formation. Seasonal and daily changes in temperature affect moisture effectiveness, biological activity, rates of chemical reactions, and kinds of vegetation (USDA, Soil Formation and Classification, 2009).

In Arches National Park, the annual mean precipitation is approximately 9 inches, but the annual precipitation can range from 7 to 11 inches. Much of the rainfall occurs as convective storms in late summer; about 10 to 30 percent of the total precipitation falls in July and August. Snowpacks are generally light and not persistent throughout the winter. The average annual temperature ranges from 53 to 57 degrees F. The frost-free (<32°F) period averages 185 days and ranges from 170 to 200 days. The soil temperature regime is mesic, and the soil moisture regimes are ustic aridic and typic aridic.

The soils in Arches National Park show the influence of the Park’s cool temperatures and short frost-free period. Areas of the world that are warmer and wetter have accelerated rates of biochemical reactions, chemical weathering, plant growth and decomposition, and other factors that affect soil development. Cooler, drier climates such as the Park’s result in soils that have comparatively less soil development, or pedogenesis.

The relatively low precipitation received in Arches is also reflected in the degree of soil development. The precipitation received is sufficient to facilitate translocation of materials through the soil profile, such as salts and clays. These materials collect at the approximate wetting front in the soil profile, or the depth to which soil moisture generally penetrates each year. Consequently, we can observe calcic horizons in some soils; these horizons are zones of calcium carbonate accumulation, characterized by lighter color and a strong reaction to cold dilute hydrochloric acid. Calcic horizon designations contain the letter “k,” as in “Bk” The Pocom family soil is

an example. In an area where the precipitation is higher than in Arches, this calcic layer would be pushed deeper down through the soil. In very high precipitation zones, all carbonates and other salts would be leached completely from the profile.

Precipitation also greatly influences the weathering and translocation of clays downward through the soil profile. Cambic horizons, denoted by the horizon designation “Bw,” are zones of some pedogenic activity, such as development of structure and/or alteration of color, but no significant accumulation of carbonates or clay. Begay soils are examples of soils that have cambic horizons.

Topography

Slope and aspect affect the moisture and temperature of soil. Steep slopes facing the sun are warmer, just like the south-facing side of a house. Steep soils may be eroded and lose their topsoil as they form. Thus, they may be thinner than the more nearly level soils that receive deposits from areas upslope.

In Arches National Park, the effects of topography on soil development may be seen in a comparison of steeper slopes with areas of more gentle slopes. Soils on steep areas such as talus slopes and hillslopes often lack an “A” horizon, or surface zones of structure and organic matter accumulation; topography plays a role in this, as erosion and gravity continually remove the top layers of the soil. Soils on gentler slopes are stable enough to develop “A” horizons, and develop soil structure, as well as other evidence of pedogenesis.

Biological factors

Plants, animals, micro-organisms, and humans affect soil formation. Animals and micro-organisms mix soils and form burrows and pores. Plant roots open channels in the soils. Different types of roots have different effects on soils. Grass roots are “fibrous” near the soil surface and easily decompose, adding organic matter. Taproots open pathways through dense layers. Micro-organisms affect chemical exchanges between roots and soil. Humans can mix the soil so extensively that the soil material is again considered parent material.

The native vegetation depends on climate, topography, and biological factors, plus many soil factors such as soil density, depth, chemistry, temperature, and moisture. Leaves from plants fall to the surface and decompose on the soil. Organisms decompose these leaves and mix them with the upper part of the soil. Trees and shrubs have large roots that may grow to considerable depths.

Time

Time has a major effect on soil formation because over time, soils exhibit features that reflect the other forming factors. Soil formation processes are continuous. Material that has been recently deposited, such as from a flood, exhibits no features that would result from soil development activities. The previous soil surface and underlying horizons become buried by new flood deposition, and the time clock resets for these soils. Terraces above the active floodplain, while genetically similar to the floodplain, are older land surfaces and exhibit more development features. They often have discernable soil structure and evidence of organic matter accumulations at the surface.

These soil forming factors continue to affect soils even on “stable” landscapes. Materials are deposited on their surface, and materials are blown or washed away from the surface. Additions, removals, and alterations are slow or rapid, depending on climate, landscape position, and biological activity. As a result of this ongoing process of soil movement, some soils have no recognizable “A” horizon, which is normally a

Figure 109.—An example of a soil surface that has a well-developed biological crust.

zone of some organic matter accumulation and structure development. Soils that develop under a sizable canopy of vegetation (such as under a juniper tree) often have a visible “A” horizon, thanks to the contribution of the organic material from the tree.

Soils that lack “A” horizons are often in areas that are more susceptible to surface removal, such as areas having relatively less microbiotic crust or steeper slopes, among other factors (fig. 109). In these soils, the surface horizon may be designated by a “C,” meaning that it more closely reflects the nature of the parent material, as organic matter has not accumulated and structure has not developed.

Subsurface horizon development also requires time in place. Many “stable” areas, such as those with lower slopes, have well-developed subsurface horizons such as calcic or cambic horizons. These horizons have developed over time because the soils do not undergo the continuous erosion caused by steeper slopes. Soils in less stable areas such as steep colluvial slopes are susceptible to movement downslope by gravity and water; this frequent movement of the soil material impedes pedogenic development. Both the surface and subsurface horizons are more reflective of the parent material.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation. The degree to which material having cation-exchange properties is

saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Butte. An isolated small mountain or hill with steep or precipitous sides and a top variously flat, rounded, or pointed that may be a residual mass isolated by erosion or an exposed volcanic neck.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Canyon. A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility). See Linear extensibility.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conglomerate. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coppice dune. A small dune of fine grained soil material stabilized around shrubs or small trees.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more

than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement. On a desert surface, a layer of gravel or larger fragments that was emplaced by upward movement of the underlying sediments or that remains after finer particles have been removed by running water or the wind.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.
Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.
Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.
Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.
Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.
Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.
Fine textured soil. Sandy clay, silty clay, or clay.
Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.
Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.
Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.
Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.
Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.
Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).
Forb. Any herbaceous plant not a grass or a sedge.
Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.
Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.
Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.
Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.
Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.
Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.
Ground cover. The percentage of material (e.g. litter, standing dead vegetation, gravel/rocks, vegetation and biological crust) covering the land surface.
Ground water. Water filling all the unblocked pores of the material below the water table.
Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is

one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hard to reclaim (in tables). Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Head out. To form a flower head.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water

table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Knoll. A small, low, rounded hill rising above adjacent landforms.

K_{sat}. Saturated hydraulic conductivity. (See Permeability.)

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate,

gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mesa. A broad, nearly flat topped and commonly isolated upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 0.0,015 inch
Very slow	0.0,015 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features

indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water. The runoff values in this survey were assigned using locally-derived criteria (fig. 110).

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

RUNOFF

SURFACE RUNOFF - Surface runoff (Hortonian flow, overland flow) is the flow of water from an area that occurs over the surface of the soil. Surface runoff differs from internal flow or throughflow that results when infiltrated water moves laterally or vertically within a soil, above the water table. "The Index (of) Surface Runoff Classes" are relative estimates of surface runoff based on slope gradient and saturated hydraulic conductivity (K_{sat}). This index is specific to the following conditions (Soil Survey Staff, 1993).

- The soil surface is assumed to be bare.
- The soil is free of ice.
- Retention of water by ground surface irregularities is negligible or low.
- Infiltration is assumed to be at the steady ponded infiltration stage.
- Water is added to the soil by precipitation or snowmelt that yields 50 mm in 24 hours with no more than 25 mm in any 1-hour period.
- Antecedent soil water state is assumed to be very moist or wet to: a) the base of the solum; b) a depth of 1/2 m; or c) through the horizon that has the minimum K_{sat} within the top 1 meter; whichever is the least depth.

Use the following table and the above conditions to estimate "The Index (of) Surface Runoff Class" for the site. If seasonal or permanent, internal free-water occurs a depth of ≤ 50 cm (very shallow and shallow Internal Free-water classes), use a K_{sat} of *Very Low*. If seasonal or permanent, internal free-water is deeper than 50 cm, use the appropriate K_{sat} from the table. In PDP, if estimating runoff from vegetated areas, define and record under **User Defined Property**.

Index (of) Surface Runoff Classes

Slope Gradient Percent	Saturated Hydraulic Conductivity (K_{sat}) Class [1]					
	Very High	High	Mod. High	Mod. Low	Low	Very Low
	cm / hour					
	≥ 36	3.6 to < 36	0.36 to < 3.6	0.036 to < 0.36	0.0036 to < 0.036	< 0.0036
Concave	N	N	N	N	N	N
< 1	N	N	N	L	M	H
1 to < 5	N	VL	L	M	H	VH
5 to < 10	VL	L	M	H	VH	VH
10 to < 20	VL	L	M	H	VH	VH
≥ 20	L	M	H	VH	VH	VH

[1] This table is based on the minimum K_{sat} occurring within 1/2 m of the soil surface. If the minimum K_{sat} for the soil occurs between 1/2 to 1 m, the runoff estimate should be reduced by one class (e.g., *Medium* to *Low*). If the minimum K_{sat} for the soil occurs below 1 meter, use the lowest K_{sat} class that occurs within 1 m of the surface.

Index (of) Surface Runoff Class Names	Code
Negligible	N
Very Low	VL
Low	L
Medium	M
High	H
Very High	VH

Figure 110.—Surface Runoff (Schoeneberger, 2002).

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic*

(vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth’s surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1980-2000 at Arches National Park HQ, UT0336)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	42.8	20.0	31.4	59	3	11	0.58	0.24	0.83	1	1.8
February---	50.9	26.7	38.8	70	7	69	0.44	0.15	0.73	1	0.9
March------	62.0	35.5	48.7	80	21	282	0.85	0.34	1.37	2	0.9
April------	70.2	41.9	56.1	89	27	483	0.84	0.19	1.45	2	0.0
May--------	81.0	51.1	66.1	97	36	808	0.74	0.15	1.22	2	0.0
June-------	92.3	60.4	76.4	106	45	1091	0.42	0.04	0.75	1	0.0
July-------	98.2	66.9	82.6	109	55	1320	0.86	0.24	1.50	2	0.0
August-----	96.3	66.1	81.2	107	54	1277	0.99	0.42	1.57	2	0.0
September--	86.8	55.6	71.2	101	39	935	0.77	0.29	1.16	2	0.0
October----	72.7	41.8	57.2	91	26	536	1.32	0.36	2.30	2	0.0
November---	55.8	30.8	43.3	74	17	145	0.67	0.14	1.25	2	0.4
December---	44.1	22.3	33.2	61	7	14	0.46	0.18	0.72	1	2.1
Yearly:											
Average---	71.1	43.3	57.2	---	---	---	---	---	---	---	---
Extreme---	112	-8	---	109	1	---	---	---	---	---	---
Total-----	---	---	---	---	---	6970	8.94	6.78	10.76	20	6.1

Average number of days with at least 1 inch of snow on the ground: 14.

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1980-2000 at Arches National Park HQ, UT0336)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 26	April 18	April 30
2 years in 10 later than--	March 12	April 11	April 25
5 years in 10 later than--	March 3	March 29	April 14
First freezing temperature in fall:			
1 year in 10 earlier than--	October 30	October 15	October 11
2 years in 10 earlier than--	November 3	October 24	October 13
5 years in 10 earlier than--	November 18	November 5	October 25

Table 3.--Growing Season

(Recorded in the period 1980-2000 at Arches National Park HQ, UT0336)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	229	195	172
8 years in 10	237	205	181
5 years in 10	252	224	198
2 years in 10	267	243	215
1 year in 10	275	253	224

Table 4.--Taxonomic Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series.)

Soil name	Family or higher taxonomic class
Arches	Mixed, mesic Lithic Torripsamments
Begay	Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Bowington	Sandy, mixed, mesic Oxyaquic Torrifluvents
Chedeski family	Loamy, mixed, superactive, mesic, shallow Ustic Haplocambids
Crosscan family	Loamy-skeletal, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents
*Hanksville	Clayey, mixed, active, calcareous, mesic, shallow Typic Torriorthents
Livan family	Sandy-skeletal, mixed, mesic Ustic Torrifluvents
Mident family	Mixed, mesic, shallow Ustic Torripsamments
Mido	Mixed, mesic Ustic Torripsamments
Milok	Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids
Moclom	Mixed, mesic Lithic Torripsamments
Monue	Coarse-loamy, mixed, superactive, mesic Typic Haplocambids
*Patterfield	Coarse-loamy, mixed, superactive, mesic Ustifluventic Haplocambids
Pensom	Mixed, mesic Ustic Torripsamments
Persayo	Loamy, mixed, active, calcareous, mesic, shallow Typic Torriorthents
Pocum family	Loamy, mixed, superactive, mesic, shallow Calcic Petrocalcids
*Radnik	Sandy, mixed, mesic Ustic Torrifluvents
Reef	Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Remorris	Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents
Retsabal	Loamy, gypsic, mesic, shallow Ustic Torriorthents
Rizno	Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Simel	Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents
Somorent family	Loamy, mixed, superactive, calcareous, mesic, shallow Typic Torriorthents

Table 5.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
80	Remorris loam, 5 to 45 percent slopes	1,575	2.0
81	Rock outcrop-Moclom-Simel complex, 2 to 30 percent slopes	1,032	1.3
83	Rock outcrop-Arches-Pensom family complex, 2 to 15 percent slopes	5,814	7.3
85	Rock outcrop-Mident family-Mido complex, 15 to 30 percent slopes	8,511	10.6
86	Arches-Rock outcrop complex, Entrada Formation, 2 to 15 percent slopes	8,015	10.0
87	Arches-Rock outcrop complex, 2 to 15 percent slopes	2,956	3.7
88	Crosscan family-Rock outcrop complex, 5 to 30 percent slopes	4,997	6.2
89	Reef-Rock outcrop complex, 5 to 30 percent slopes	1,183	1.5
91	Mido-Mido, strongly calcareous complex, 2 to 30 percent slopes	6,046	7.6
100	Arches-Rizno-Rock outcrop complex, 2 to 15 percent slopes	4,849	6.1
103	Mido, strongly calcareous-Mido complex, 2 to 15 percent slopes	4,561	5.7
106	Retsabal very fine sandy loam, 2 to 15 percent slopes	571	0.7
108	Milok-Mido, strongly calcareous complex, 2 to 15 percent slopes	5,027	6.3
110	Bowington-Radnik-Patterfield complex, 0 to 6 percent slopes	2,690	3.4
111	Hanksville-Persayo complex, 2 to 45 percent slopes	83	0.1
116	Begay fine sandy loam, 0 to 2 percent slopes, overwash	1,175	1.5
117	Rock outcrop-Arches complex, 2 to 15 percent slopes	10,030	12.5
118	Monue gravelly loamy fine sand, 1 to 6 percent slopes	160	0.2
119	Persayo-Somorent family complex, 15 to 70 percent slopes	1,050	1.3
126	Rizno-Arches-Mido complex, 2 to 15 percent slopes, very rocky	5,830	7.3
127	Pocum family, 2 to 8 percent slopes	242	0.3
129	Milok very gravelly sandy loam, 2 to 15 percent slopes, eroded	350	0.4
132	Livan family, 0 to 6 percent slopes	776	1.0
133	Chedeski family, 15 to 60 percent slopes	2,456	3.1
	Total	79,979	100.0

* Less than 0.1 percent.

Table 6.--Ecological Sites and Characteristic Plant Communities

Composition of forest understory is based on understory productivity; range site composition is based on percent dry weight. Forest understory is defined as production less than or equal to 13 feet in height. Characteristic plants are pulled from the component existing plants table in the National Soils Information System (NASIS). Absence of an entry indicates the species totalled less than one percent of annual production.

Map unit symbol soil name - % of map unit	Ecological site name and number	Total production		Characteristic plants	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/ac		Pct	Pct
80:						
Remorris - 85%--	Semidesert Shallow Sandy Loam (Blackbrush) (R035XY233UT)	Favorable	275	blackbrush		60
		Normal	200	shadscale saltbush		20
		Unfavorable	75	galleta		5
				Torrey Mormon tea		3
				Jones's pepperweed		2
81:						
Moclom - 30%----	Shallow Sand Rock Pocket (Utah Juniper/Pinyon) (R035XY019UT)	Favorable	500	Bigelow sagebrush		20
		Normal	375	Stansbury cliffrose		20
		Unfavorable	200	Utah juniper		20
				Havard oak		10
				Salina wildrye		5
				littleleaf mountain-mahogany		5
				twoneedle pinyon		5
Simel - 25%-----	Semidesert Shallow Sandy Loam (Utah Juniper-Blackbrush) (R035XY236UT)	Favorable	300	Salina wildrye		25
		Normal	200	Bigelow sagebrush		10
		Unfavorable	100	Indian ricegrass		10
				Utah juniper		10
				crispleaf buckwheat		10
				galleta		10
				blackbrush		5
				green Mormon tea		5
83:						
Arches - 20%----	Shallow Sand Rock Pocket (Utah Juniper/Pinyon) (R035XY019UT)	Favorable	500	Utah juniper		20
		Normal	300	Bigelow sagebrush		15
		Unfavorable	150	Havard oak		10
				Stansbury cliffrose		10
				littleleaf mountain-mahogany		10
				blackbrush		8
				Indian ricegrass		5
				broom snakeweed		5
Pensom - 20%----	Shallow Sand Rock Pocket (Utah Juniper/Pinyon) (R035XY019UT)	Favorable	500	Utah juniper		20
		Normal	300	Bigelow sagebrush		15
		Unfavorable	150	Havard oak		10
				Stansbury cliffrose		10
				littleleaf mountain-mahogany		10
				blackbrush		8
				Indian ricegrass		5
				broom snakeweed		5

Table 6.--Ecological Sites and Characteristic Plant Communities—Continued

(Composition of forest understory is based on canopy cover; range sites are based on percent weight.)

Map unit symbol soil name - % of map unit	Ecological site name and number	Total production		Characteristic plants	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/ac		Pct	Pct
85:						
Mident Family - 15%------------	Shallow Sand Rock Pocket (Utah Juniper/Pinyon) (R035XY019UT)	Favorable	900	littleleaf mountain-mahogany		20
		Normal	800	Stansbury cliffrose		15
		Unfavorable	700	Utah juniper		15
				Havard oak		10
				Utah serviceberry		10
				singleleaf ash		10
				twoneedle pinyon		8
				green Mormon tea		5
				needle and thread		5
Mido - 15%------	Semidesert Sand (Dune) (R035XY211UT)	Favorable	500	blackbrush		50
		Normal	400	Havard oak		20
		Unfavorable	300	Utah juniper		15
				broom snakeweed		8
				green Mormon tea		6
86:						
Arches - 50%----	Shallow Sand Rock Pocket (Utah Juniper/Pinyon) (R035XY019UT)	Favorable	900	Havard oak		20
		Normal	800	Stansbury cliffrose		10
		Unfavorable	700	Utah juniper		10
				Utah serviceberry		10
				littleleaf mountain-mahogany		10
				twoneedle pinyon		8
				green Mormon tea		5
				needle and thread		5
				singleleaf ash		5
87:						
Arches - 50%----	Semidesert Shallow Sandy Loam (Utah Juniper-Blackbrush) (R035XY236UT)	Favorable	350	blackbrush		50
		Normal	250	Utah juniper		15
		Unfavorable	150	green Mormon tea		10
				broom snakeweed		8
				twoneedle pinyon		6
				Havard oak		5
88:						
Crosscan Family - 75%----------	Semidesert Shallow Sandy Loam (Utah Juniper-Blackbrush) (R035XY236UT)	Favorable	300	blackbrush		40
		Normal	250	Utah juniper		15
		Unfavorable	100	green Mormon tea		10
				Havard oak		8
				Stansbury cliffrose		5
				twoneedle pinyon		5
89:						
Reef - 40%------	Semidesert Shallow Sandy Loam (Utah Juniper-Blackbrush) (R035XY236UT)	Favorable	300	blackbrush		50
		Normal	250	Utah juniper		15
		Unfavorable	100	green Mormon tea		5
				singleleaf ash		5
				spurge		3
				twoneedle pinyon		3

Table 6.--Ecological Sites and Characteristic Plant Communities--Continued

(Composition of forest understory is based on canopy cover; range sites are based on percent weight.)

Map unit symbol soil name - % of map unit	Ecological site name and number	Total production		Characteristic plants	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/ac		Pct	Pct
91:						
Mido - 80%------	Semidesert Sand (Dune)	Favorable	600	rosemary mint		40
	(R035XY211UT)	Normal	450	Resinbush		25
		Unfavorable	300	Indian ricegrass		10
				sand sagebrush		5
Mido - 15%------	Semidesert Sand	Favorable	350	blackbrush		65
	(Blackbrush)	Normal	250	Havard oak		8
	(R035XY210UT)	Unfavorable	100	Indian ricegrass		8
				galleta		5
				Utah juniper		2
100:						
Arches - 35%----	Shallow Sand Rock Pocket	Favorable	450	Utah juniper		15
	(Utah Juniper/Pinyon)	Normal	350	Bigelow sagebrush		10
	(R035XY019UT)	Unfavorable	250	Jones's pepperweed		10
				singleleaf ash		10
				sumac		10
				Brickellia		8
				Stansbury cliffrose		8
				purple threeawn		8
				green Mormon tea		5
				twoneedle pinyon		5
Rizno - 30%-----	Shallow Sand Rock Pocket	Favorable	500	Utah juniper		20
	(Utah Juniper/Pinyon)	Normal	400	rock goldenrod		10
	(R035XY019UT)	Unfavorable	300	twoneedle pinyon		10
				Jones's pepperweed		8
				Bigelow sagebrush		5
				Brickellia		5
				Stansbury cliffrose		5
				green Mormon tea		5
				singleleaf ash		5
				yellow rabbitbrush		5
103:						
Mido - 80%------	Semidesert Sand	Favorable	500	blackbrush		60
	(Blackbrush)	Normal	250	sand sagebrush		15
	(R035XY210UT)	Unfavorable	100	Cutler Mormon tea		5
				Torrey's jointfir		3
				galleta		2
				plains pricklypear		2
Mido - 15%------	Semidesert Sand	Favorable	300	sand sagebrush		45
	(Blackbrush)	Normal	200	blackbrush		35
	(R035XY210UT)	Unfavorable	100	Cutler Mormon tea		10
				Indian ricegrass		5
106:						
Retsabal - 85%--	Semidesert Shallow Gypsum	Favorable	200	Torrey Mormon tea		50
	(Mormontea) (R035XY237UT)	Normal	150	fourwing saltbush		20
		Unfavorable	100	Desert Princesplume		5
				Jones's pepperweed		5
				galleta		5

Table 6.--Ecological Sites and Characteristic Plant Communities--Continued

(Composition of forest understory is based on canopy cover; range sites are based on percent weight.)

Map unit symbol soil name - % of map unit	Ecological site name and number	Total production: Kind of year	Total production: Dry weight	Characteristic plants	Composition: Forest	Composition: Range
			Lb/ac		Pct	Pct
108:						
Milok - 70%-----	Semidesert Sandy Loam (Fourwing Saltbush) (R035XY215UT)	Favorable	300	Indian ricegrass		50
		Normal	250	galleta		15
		Unfavorable	100	fourwing saltbush		7
				cheatgrass		5
				blackbrush		2
Mido - 25%------	Semidesert Sand (Fourwing Saltbush) (R035XY212UT)	Favorable	300	Cutler Mormon tea		20
		Normal	250	winterfat		15
		Unfavorable	100	Cryptantha		5
				Indian ricegrass		5
				fourwing saltbush		5
				galleta		5
				needle and thread		5
				plains pricklypear		5
110:						
Bowington - 50%-	Semiwet Fresh Streambank (Fremont Cottonwood) (R035XY013UT)	Favorable	2000	China tamarisk		35
		Normal	1500	Fremont cottonwood		35
		Unfavorable	800	coyote willow		20
				inland saltgrass		10
Radnik - 25%----	Loamy Bottom (Basin Big Sagebrush) (R035XY011UT)	Favorable	1000	fourwing saltbush		33
		Normal	800	basin big sagebrush		31
		Unfavorable	500	Fremont cottonwood		15
				sumac		5
				Indian ricegrass		3
Patterfield - 20%------------	Alkali Flat (Greasewood) (R035XY009UT)	Favorable	1000	cheatgrass		25
		Normal	800	greasewood		25
		Unfavorable	400	seepweed		20
				galleta		8
				shadscale saltbush		5
				Indian ricegrass		3
111:						
Hanksville - 45%	Desert Shallow Clay (Mat Saltbush) (R035XY124UT)	Favorable	250	mat saltbush		80
		Normal	200	valley saltbush		5
		Unfavorable	150	galleta		3
				Indian ricegrass		2
Persayo - 45%---	Desert Clay (R035XY103UT)	Favorable	250	valley saltbush		60
		Normal	200	bud sagebrush		5
		Unfavorable	150	desert trumpet buckwheat		5
				mat saltbush		2
116:						
Begay - 90%-----	Semidesert Sandy Loam (Fourwing Saltbush) (R035XY215UT)	Favorable	1000	cheatgrass		80
		Normal	700	galleta		5
		Unfavorable	300	sand dropseed		3
				fourwing saltbush		2
				prickly Russian thistle		2

Table 6.--Ecological Sites and Characteristic Plant Communities--Continued

(Composition of forest understory is based on canopy cover; range sites are based on percent weight.)

Map unit symbol soil name - % of map unit	Ecological site name and number	Total production		Characteristic plants	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/ac		Pct	Pct
117:						
Arches - 25%----	Shallow Sand Rock Pocket (Utah Juniper/Pinyon) (R035XY019UT)	Favorable	500	blackbrush		15
		Normal	400	littleleaf mountain-mahogany		15
		Unfavorable	300	Stansbury cliffrose		10
				Utah juniper		10
				desert needlegrass		10
				Bigelow sagebrush		5
				singleleaf ash		5
				twoneedle pinyon		5
118:						
Monue - 90%-----	Desert Stony Loam (Shadscale-Bud Sagebrush) (R035XY136UT)	Favorable	250	bud sagebrush		25
		Normal	200	galleta		20
		Unfavorable	150	Indian ricegrass		10
				cheatgrass		10
				shadscale saltbush		10
119:						
Persayo - 50%---	Desert Shallow Sandy Loam (Shadscale) (R035XY130UT)	Favorable	250	shadscale saltbush		60
		Normal	200	bud sagebrush		5
		Unfavorable	150	desert trumpet buckwheat		5
				mat saltbush		2
Somorent Family - 40%----------	Desert Shallow Sandy Loam (Blackbrush) (R035XY133UT)	Favorable	300	blackbrush		80
		Normal	250	shadscale saltbush		5
		Unfavorable	200	galleta		3
				Indian ricegrass		2
				Utah juniper		1
126:						
Rizno - 60%-----	Semidesert Shallow Sandy Loam (Blackbrush) (R035XY233UT)	Favorable	250	blackbrush		80
		Normal	200	Cutler Mormon tea		10
		Unfavorable	150	plains pricklypear		5
Arches - 20%----	Shallow Sand Rock Pocket (Utah Juniper/Pinyon) (R035XY019UT)	Favorable	450	Havard oak		25
		Normal	350	Utah juniper		20
		Unfavorable	250	singleleaf ash		10
				galleta		6
				Cutler Mormon tea		5
				Stansbury cliffrose		5
				broom snakeweed		5
				Indian ricegrass		4
Mido - 10%------	Semidesert Sand (Fourwing Saltbush) (R035XY212UT)	Favorable	400	sand sagebrush		60
		Normal	300	Indian ricegrass		15
		Unfavorable	200	sand dropseed		10
				purple threeawn		5
127:						
Pocum Family - 95%------------	Semidesert Shallow Sandy Loam (Blackbrush) (R035XY233UT)	Favorable	350	blackbrush		90
		Normal	250	green Mormon tea		5
		Unfavorable	150			

Table 6.--Ecological Sites and Characteristic Plant Communities--Continued

(Composition of forest understory is based on canopy cover; range sites are based on percent weight.)

Map unit symbol soil name - % of map unit	Ecological site name and number	Total production		Characteristic plants	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/ac		Pct	Pct
129:						
Milok - 75%-----	Semidesert Sandy Loam (Blackbrush) (R035XY218UT)	Favorable	350	blackbrush		75
		Normal	250	galleta		5
		Unfavorable	150	green Mormon tea		5
				Cutler Mormon tea		2
				Indian ricegrass		2
132:						
Livan Family - 85%------------	Sandy Bottom (Fourwing Saltbush) (R035XY015UT)	Favorable	500	blue grama		25
		Normal	400	prickly Russian thistle		25
		Unfavorable	300	sand sagebrush		20
				fourwing saltbush		10
				scarlet globemallow		5
133:						
Chedeski Family - 90%----------	Semidesert Steep Shallow Loam (Utah Juniper-Pinyon) (R035XY240UT)	Favorable	350	blackbrush		25
		Normal	275	Salina wildrye		20
		Unfavorable	200	skunkbush sumac		15
				Utah serviceberry		10
				Torrey Mormon tea		5
				Utah juniper		5
				galleta		5

Table 7.--Index of Plant Symbols, Common Names, and Scientific Names

Plants displayed occur within the National Soils Information System (NASIS) plant tables used for the soil survey area. The scientific and common names are referenced at the USDA PLANTS database: plants.usda.gov.

Plant Symbol	Local Common Name	Scientific Name
ACHY	Indian ricegrass	Achnatherum hymenoides
ACSP12	desert needlegrass	Achnatherum speciosum
AMUT	Utah serviceberry	Amelanchier utahensis
ARBI3	Bigelow sagebrush	Artemisia bigelovii
ARFI2	sand sagebrush	Artemisia filifolia
ARPU9	purple threeawn	Aristida purpurea
ARSP5	bud sagebrush	Artemisia spinescens
ARTRT	basin big sagebrush	Artemisia tridentata ssp. tridentata
ATCA2	fourwing saltbush	Atriplex canescens
ATCO	shadscale saltbush	Atriplex confertifolia
ATCO4	mat saltbush	Atriplex corrugata
ATCU	valley saltbush	Atriplex cuneata
BOGR2	blue grama	Bouteloua gracilis
BRICK	Brickellia	Brickellia
BRTE	cheatgrass	Bromus tectorum
CEIN7	littleleaf mountain-mahogany	Cercocarpus intricatus
CHVI8	yellow rabbitbrush	Chrysothamnus viscidiflorus
CORA	blackbrush	Coleogyne ramosissima
CRYPT	Cryptantha	Cryptantha
DISP	inland saltgrass	Distichlis spicata
EPCU	Cutler Mormon tea	Ephedra cutleri
EPTO	Torrey Mormon tea	Ephedra torreyana
EPTO	Torrey's jointfir	Ephedra torreyana
EPVI	green Mormon tea	Ephedra viridis
ERCO14	crispleaf buckwheat	Eriogonum corymbosum
ERIN4	desert trumpet buckwheat	Erigonum inflaturm
EUPHO	spurge	Euphorbia
FRAN2	singleleaf ash	Fraxinus anomala
GUSA2	broom snakeweed	Gutierrezia sarothrae
HECOC8	needle and thread	Hesperostipa comata ssp. comata
JUOS	Utah juniper	Juniperus osteosperma
KRLA2	winterfat	Krascheninnikovia lanata
LEMOJ	Jones's pepperweed	Lepidium montanum varr jonesii
LESA4	Salina wildrye	Leymus salinus
OPPO	plains pricklypear	Opuntia polyacantha
PEPU7	rock goldenrod	Petradoria pumila
PIED	twoneedle pinyon	Pinus edulis
PLJA	galleta	Pleuraphis jamesii
POFR2	Fremont cottonwood	Populus fremontii
POIN3	rosemary mint	Poliomintha incana
PUST	Stansbury cliffrose	Purshia stansburiana
QUHA3	Havard's oak	Quercus havardii
RHTRT	skunkbush sumac	Rhus trilobata Nutt. var. trilobata
RHUS	sumac	Rhus
SAEX	coyote willow	Salix exigua
SATR12	prickly Russian thistle	Salsola tragus
SAVE4	greasewood	Sarcobatus vermiculatus
SPCO	scarlet globemallow	Sphaeralcea coccinea
SPCR	sand dropseed	Sporobolus cryptandrus
STPI	Desert Princesplume	Stanleya pinnata
SUAED	seepweed	Suaeda
TACH2	China tamarisk	Tamarix chinensis
VAST3	Resinbush	Vanclevea stylosa

Table 8.--Index of Common Names, Plant Symbol, and Scientific Names

Plants displayed occur within the National Soils Information System (NASIS) plant tables used for the soil survey area. The scientific and common names are referenced at the USDA PLANTS database: plants.usda.gov.

Local Common Name	Plant Symbol	Scientific Name
basin big sagebrush	ARTRT	Artemisia tridentata ssp. tridentata
Bigelow sagebrush	ARBI3	Artemisia bigelovii
blackbrush	CORA	Coleogyne ramosissima
blue grama	BOGR2	Bouteloua gracilis
Brickellia	BRICK	Brickellia
broom snakeweed	GUSA2	Gutierrezia sarothrae
bud sagebrush	ARSP5	Artemisia spinescens
cheatgrass	BRTE	Bromus tectorum
China tamarisk	TACH2	Tamarix chinensis
coyote willow	SAEX	Salix exigua
crispleaf buckwheat	ERCO14	Eriogonum corymbosum
Cryptantha	CRYPT	Cryptantha
Cutler Mormon tea	EPCU	Ephedra cutleri
desert needlegrass	ACSP12	Achnatherum speciosum
Desert Princesplume	STPI	Stanleya pinnata
desert trumpet buckwheat	ERIN4	Erigonum inflaturm
fourwing saltbush	ATCA2	Atriplex canescens
Fremont cottonwood	POFR2	Populus fremontii
galleta	PLJA	Pleuraphis jamesii
greasewood	SAVE4	Sarcobatus vermiculatus
green Mormon tea	EPVI	Ephedra viridis
Havard's oak	QUHA3	Quercus havardii
Indian ricegrass	ACHY	Achnatherum hymenoides
inland saltgrass	DISP	Distichlis spicata
Jones's pepperweed	LEMOJ	Lepidium montanum varr jonesii
littleleaf mountain-mahogany	CEIN7	Cercocarpus intricatus
mat saltbush	ATCO4	Atriplex corrugata
needle and thread	HECOC8	Hesperostipa comata ssp. comata
plains pricklypear	OPPO	Opuntia polyacantha
prickly Russian thistle	SATR12	Salsola tragus
purple threeawn	ARPU9	Aristida purpurea
Resinbush	VAST3	Vanclevea stylosa
rock goldenrod	PEPU7	Petradoria pumila
rosemary mint	POIN3	Poliomintha incana
Salina wildrye	LESA4	Leymus salinus
sand dropseed	SPCR	Sporobolus cryptandrus
sand sagebrush	ARFI2	Artemisia filifolia
scarlet globemallow	SPCO	Sphaeralcea coccinea
seepweed	SUAED	Suaeda
shadscale saltbush	ATCO	Atriplex confertifolia
singleleaf ash	FRAN2	Fraxinus anomala
skunkbush sumac	RHTRT	Rhus trilobata Nutt. var. trilobata
spurge	EUPHO	Euphorbia
Stansbury cliffrose	PUST	Purshia stansburiana
sumac	RHUS	Rhus
Torrey Mormon tea	EPTO	Ephedra torreyana
Torrey's jointfir	EPTO	Ephedra torreyana
twoneedle pinyon	PIED	Pinus edulis
Utah juniper	JUOS	Juniperus osteosperma
Utah serviceberry	AMUT	Amelanchier utahensis
valley saltbush	ATCU	Atriplex cuneata
winterfat	KRLA2	Krascheninnikovia lanata
yellow rabbitbrush	CHVI8	Chrysothamnus viscidiflorus

Table 9.--Land Management - Suitability for Planting and Soil Rutting Hazard

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Suitability for hand planting: Rating class and limiting features	Value	Suitability for mechanical planting: Rating class and limiting features	Value	Soil Rutting Hazard: Rating class and limiting features	Value
80:							
Remorris	85	Unsuited		Unsuited		Severe	
		Rock fragments	1.00	Rock fragments	1.00	Low strength	1.00
		Restrictive layer	0.75	Slope	0.75		
81:							
Moclom	30	Unsuited		Unsuited		Moderate	
		Restrictive layer	1.00	Restrictive layer	1.00	Low strength	0.50
		Rock fragments	0.50	Rock fragments	0.75		
				Slope	0.50		
Simel	25	Unsuited		Unsuited		Moderate	
		Rock fragments	1.00	Rock fragments	1.00	Low strength	0.50
		Restrictive layer	0.50	Slope	1.00		
		Stickiness; high plasticity index	0.50	Stickiness; high plasticity index	0.50		
83:							
Arches	20	Moderately suited		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
				Slope	0.50		
Pensom	20	Moderately suited		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
				Slope	0.50		
85:							
Mident family	15	Moderately suited		Poorly suited		Moderate	
		Restrictive layer	0.50	Slope	0.75	Low strength	0.50
		Sandiness	0.50	Sandiness	0.50		
Mido	15	Moderately suited		Poorly suited		Moderate	
		Sandiness	0.50	Slope	0.75	Low strength	0.50
				Sandiness	0.50		
86:							
Arches	50	Unsuited		Unsuited		Moderate	
		Restrictive layer	1.00	Restrictive layer	1.00	Low strength	0.50
				Slope	0.50		
87:							
Arches	50	Moderately suited		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
				Slope	0.50		
88:							
Crosscan family	75	Poorly suited		Poorly suited		Moderate	
		Restrictive layer	0.75	Rock fragments	0.75	Low strength	0.50
		Rock fragments	0.50	Slope	0.50		

Table 9.--Land Management - Suitability for Planting and Soil Rutting Hazard--Continued

Map symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil Rutting Hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
89:							
Reef----------------	40	Unsuited		Unsuited		Moderate	
		Restrictive layer	1.00	Rock fragments	1.00	Low strength	0.50
		Rock fragments	0.75	Restrictive layer	1.00		
				Slope	0.50		
91:							
Mido----------------	80	Moderately suited		Poorly suited		Moderate	
		Sandiness	0.50	Slope	0.75	Low strength	0.50
				Sandiness	0.50		
Mido, strongly calcareous---------	15	Moderately suited		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
				Slope	0.50		
100:							
Arches--------------	35	Unsuited		Unsuited		Moderate	
		Restrictive layer	1.00	Restrictive layer	1.00	Low strength	0.50
		Rock fragments	0.50	Rock fragments	0.75		
				Slope	0.50		
Rizno---------------	30	Unsuited		Unsuited		Moderate	
		Restrictive layer	1.00	Restrictive layer	1.00	Low strength	0.50
				Rock fragments	0.50		
				Slope	0.50		
103:							
Mido, strongly calcareous---------	80	Moderately suited		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
				Slope	0.50		
Mido----------------	15	Moderately suited		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
106:							
Retsabal------------	85	Well suited		Well suited		Severe	
						Low strength	1.00
108:							
Milok---------------	70	Well suited		Well suited		Moderate	
						Low strength	0.50
Mido, strongly calcareous---------	25	Well suited		Moderately suited		Moderate	
				Slope	0.50	Low strength	0.50
110:							
Bowington-----------	50	Moderately suited		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
Radnik--------------	25	Moderately suited		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
Patterfield---------	20	Moderately suited		Poorly suited		Moderate	
		Rock fragments	0.50	Rock fragments	0.75	Low strength	0.50

Table 9.--Land Management - Suitability for Planting and Soil Rutting Hazard--Continued

Map symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil Rutting Hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
111:							
Hanksville	45	Moderately suited		Unsuited		Severe	
		Slope	0.50	Slope	1.00	Low strength	1.00
		Stickiness; high plasticity index	0.50	Rock fragments	0.75		
		Rock fragments	0.50	Stickiness; high plasticity index	0.50		
Persayo	45	Moderately suited		Unsuited		Severe	
		Restrictive layer	0.50	Slope	1.00	Low strength	1.00
		Slope	0.50	Stickiness; high plasticity index	0.50		
		Stickiness; high plasticity index	0.50	Rock fragments	0.50		
116:							
Begay, overwash	90	Well suited		Well suited		Moderate	
						Low strength	0.50
117:							
Arches	25	Unsuited		Unsuited		Moderate	
		Restrictive layer	1.00	Restrictive layer	1.00	Low strength	0.50
		Rock fragments	0.50	Rock fragments	0.75		
				Slope	0.50		
118:							
Monue	90	Poorly suited		Unsuited		Moderate	
		Rock fragments	0.75	Rock fragments	1.00	Low strength	0.50
119:							
Persayo	50	Moderately suited		Poorly suited		Severe	
		Stickiness; high plasticity index	0.50	Slope	0.75	Low strength	1.00
				Stickiness; high plasticity index	0.50		
Somorent family	40	Moderately suited		Moderately suited		Moderate	
		Restrictive layer	0.50	Slope	0.50	Low strength	0.50
				Rock fragments	0.50		
126:							
Rizno	60	Well suited		Moderately suited		Moderate	
				Slope	0.50	Low strength	0.50
Arches	20	Unsuited		Unsuited		Moderate	
		Restrictive layer	1.00	Restrictive layer	1.00	Low strength	0.50
		Sandiness	0.50	Sandiness	0.50		
Mido	10	Moderately suited		Moderately suited		Moderate	
		Sandiness	0.50	Slope	0.50	Low strength	0.50
				Sandiness	0.50		
127:							
Pocum family	95	Well suited		Moderately suited		Moderate	
				Rock fragments	0.50	Low strength	0.50

Table 9.--Land Management - Suitability for Planting and Soil Rutting Hazard--Continued

Map symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil Rutting Hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
129:							
Milok	75	Moderately suited		Poorly suited		Moderate	
		Rock fragments	0.50	Rock fragments	0.75	Low strength	0.50
				Slope	0.50		
132:							
Livan family	85	Moderately suited		Moderately suited		Moderate	
		Sandiness	0.50	Sandiness	0.50	Low strength	0.50
133:							
Chedeski family	90	Unsuited		Unsuited		Moderate	
		Rock fragments	1.00	Rock fragments	1.00	Low strength	0.50
		Slope	0.50	Slope	1.00		
		Stickiness; high plasticity index	0.50	Stickiness; high plasticity index	0.50		

Table 10.--Land Management - Hazard of Erosion and Suitability for Roads

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion: Rating class and limiting features	Value	Hazard of erosion on roads and trails: Rating class and limiting features	Value	Suitability for roads (natural surface): Rating class and limiting features	Value
80:							
Remorris------------	85	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Rock fragments	1.00
						Slope	1.00
						Low strength	0.50
81:							
Moclom--------------	30	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Rock fragments	0.50
Simel---------------	25	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Rock fragments	1.00
						Slope	1.00
83:							
Arches--------------	20	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00
						Sandiness	0.50
Pensom--------------	20	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Sandiness	0.50
85:							
Mident family-------	15	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00
						Sandiness	0.50
Mido----------------	15	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00
						Sandiness	0.50
86:							
Arches--------------	50	Slight		Severe		Poorly suited	
				Slope/erodibility	0.95	Slope	1.00
87:							
Arches--------------	50	Slight		Severe		Moderately suited	
				Slope/erodibility	0.95	Slope	0.50
						Sandiness	0.50
88:							
Crosscan family-----	75	Slight		Moderate		Poorly suited	
				Slope/erodibility	0.50	Slope	1.00
						Rock fragments	0.50
89:							
Reef----------------	40	Slight		Moderate		Poorly suited	
				Slope/erodibility	0.50	Rock fragments	1.00

Table 10.--Land Management - Hazard of Erosion and Suitability for Roads--Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion: Rating class and limiting features	Value	Hazard of erosion on roads and trails: Rating class and limiting features	Value	Suitability for roads (natural surface): Rating class and limiting features	Value
91:							
Mido----------------	80	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00
						Sandiness	0.50
Mido, strongly calcareous---------	15	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Sandiness	0.50
100:							
Arches--------------	35	Slight		Severe		Moderately suited	
				Slope/erodibility	0.95	Slope	0.50
Rizno---------------	30	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
103:							
Mido, strongly calcareous---------	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Sandiness	0.50
						Slope	0.50
Mido----------------	15	Slight		Slight		Moderately suited	
						Sandiness	0.50
106:							
Retsabal------------	85	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
108:							
Milok---------------	70	Slight		Moderate		Well suited	
				Slope/erodibility	0.50		
Mido, strongly calcareous---------	25	Slight		Severe		Poorly suited	
				Slope/erodibility	0.95	Slope	1.00
110:							
Bowington-----------	50	Slight		Slight		Poorly suited	
						Flooding	1.00
						Sandiness	0.50
Radnik--------------	25	Slight		Slight		Moderately suited	
						Flooding	0.50
Patterfield---------	20	Slight		Moderate		Well suited	
				Slope/erodibility	0.50		
111:							
Hanksville----------	45	Severe		Severe		Poorly suited	
		Slope/erodibility	0.75	Slope/erodibility	0.95	Slope	1.00
						Low strength	0.50
Persayo-------------	45	Severe		Severe		Poorly suited	
		Slope/erodibility	0.75	Slope/erodibility	0.95	Slope	1.00
						Low strength	0.50

Table 10.--Land Management - Hazard of Erosion and Suitability for Roads--Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
116:							
Begay, overwash-----	90	Slight		Slight		Well suited	
117:							
Arches--------------	25	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
118:							
Monue---------------	90	Slight		Slight		Moderately suited	
						Rock fragments	0.50
119:							
Persayo-------------	50	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00
						Low strength	0.50
Somorent family-----	40	Moderate		Moderate		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.50	Slope	1.00
126:							
Rizno---------------	60	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
Arches--------------	20	Slight		Slight		Moderately suited	
						Sandiness	0.50
Mido----------------	10	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Sandiness	0.50
127:							
Pocum family--------	95	Slight		Slight		Well suited	
129:							
Milok---------------	75	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Sandiness	0.50
132:							
Livan family--------	85	Slight		Slight		Moderately suited	
						Flooding	0.50
						Sandiness	0.50
133:							
Chedeski family-----	90	Severe		Severe		Poorly suited	
		Slope/erodibility	0.75	Slope/erodibility	0.95	Slope	1.00
						Rock fragments	1.00

Table 11.--Land Management - Site Preparation

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (surface)		Suitability for mechanical site preparation (deep)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
80:					
Remorris	85	Unsuited		Unsuited	
		Rock fragments	1.00	Rock fragments	1.00
		Slope	0.50	Slope	0.50
81:					
Moclom	30	Unsuited		Unsuited	
		Restrictive layer	1.00	Restrictive layer	1.00
		Rock fragments	0.50	Rock fragments	0.50
Simel	25	Unsuited		Unsuited	
		Rock fragments	1.00	Restrictive layer	1.00
		Slope	0.50	Rock fragments	1.00
				Slope	0.50
83:					
Arches	20	Poorly suited		Unsuited	
		Slope	0.50	Restrictive layer	1.00
				Slope	0.50
Pensom	20	Well suited		Poorly suited	
				Restrictive layer	0.50
85:					
Mident family	15	Poorly suited		Unsuited	
		Slope	0.50	Restrictive layer	1.00
				Slope	0.50
Mido	15	Poorly suited		Poorly suited	
		Slope	0.50	Slope	0.50
86:					
Arches	50	Unsuited		Unsuited	
		Restrictive layer	1.00	Restrictive layer	1.00
87:					
Arches	50	Well suited		Unsuited	
				Restrictive layer	1.00
88:					
Crosscan family	75	Poorly suited		Unsuited	
		Rock fragments	0.50	Restrictive layer	1.00
89:					
Reef	40	Unsuited		Unsuited	
		Rock fragments	1.00	Restrictive layer	1.00
		Restrictive layer	1.00	Rock fragments	1.00

Table 11.--Land Management - Site Preparation--Continued

Map symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (surface)		Suitability for mechanical site preparation (deep)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
91:					
Mido	80	Poorly suited		Poorly suited	
		Slope	0.50	Slope	0.50
Mido, strongly calcareous	15	Well suited		Well suited	
100:					
Arches	35	Unsuited		Unsuited	
		Restrictive layer	1.00	Restrictive layer	1.00
Rizno	30	Unsuited		Unsuited	
		Restrictive layer	1.00	Restrictive layer	1.00
103:					
Mido, strongly calcareous	80	Well suited		Well suited	
Mido	15	Well suited		Well suited	
106:					
Retsabal	85	Well suited		Well suited	
108:					
Milok	70	Well suited		Well suited	
Mido, strongly calcareous	25	Well suited		Well suited	
110:					
Bowington	50	Well suited		Well suited	
Radnik	25	Well suited		Well suited	
Patterfield	20	Well suited		Well suited	
111:					
Hanksville	45	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50		
Persayo	45	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
116:					
Begay, overwash	90	Well suited		Well suited	
117:					
Arches	25	Unsuited		Unsuited	
		Restrictive layer	1.00	Restrictive layer	1.00
118:					
Monue	90	Poorly suited		Poorly suited	
		Rock fragments	0.50	Rock fragments	0.50
119:					
Persayo	50	Poorly suited		Poorly suited	
		Slope	0.50	Slope	0.50

Table 11.--Land Management - Site Preparation--Continued

Map symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (surface)		Suitability for mechanical site preparation (deep)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
119:					
Somorent family-----	40	Poorly suited		Unsuited	
		Slope	0.50	Restrictive layer	1.00
				Slope	0.50
126:					
Rizno---------------	60	Well suited		Unsuited	
				Restrictive layer	1.00
Arches--------------	20	Unsuited		Unsuited	
		Restrictive layer	1.00	Restrictive layer	1.00
Mido----------------	10	Well suited		Well suited	
127:					
Pocum family--------	95	Well suited		Poorly suited	
				Restrictive layer	0.50
129:					
Milok---------------	75	Poorly suited		Well suited	
		Rock fragments	0.50		
132:					
Livan family--------	85	Well suited		Well suited	
133:					
Chedeski family-----	90	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	1.00	Rock fragments	0.50

Table 12.--Land Management - Damage by Fire and Seedling Mortality

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Potential for damage to soil by fire: Rating class and limiting features	Potential for damage to soil by fire: Value	Potential for seedling mortality: Rating class and limiting features	Potential for seedling mortality: Value
80:					
Remorris------------	85	Moderate		Moderate	
		Texture/surface depth/rock fragments	0.50	Available water	0.50
				Carbonate content	0.50
				Soil reaction	0.50
81:					
Moclom--------------	30	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
Simel---------------	25	High		Moderate	
		Texture/slope/surface depth/rock fragments	1.00	Available water	0.50
				Soil reaction	0.50
83:					
Arches--------------	20	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
Pensom--------------	20	High		High	
		Texture/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
85:					
Mident family-------	15	High		Moderate	
		Texture/rock fragments	1.00	Available water	0.50
				Soil reaction	0.50
Mido----------------	15	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
86:					
Arches--------------	50	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50

Table 12.--Land Management - Damage by Fire and Seedling Mortality--Continued

Map symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
87:					
Arches--------------	50	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
88:					
Crosscan family-----	75	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
89:					
Reef----------------	40	Moderate		High	
		Texture/rock fragments	0.50	Available water	1.00
				Soil reaction	0.50
91:					
Mido----------------	80	High		High	
		Texture/rock fragments	1.00	Available water	1.00
Mido, strongly calcareous---------	15	High		High	
		Texture/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
100:					
Arches--------------	35	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
Rizno---------------	30	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
103:					
Mido, strongly calcareous---------	80	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50

Table 12.--Land Management - Damage by Fire and Seedling Mortality--Continued

Map symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
103:					
Mido----------------	15	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
106:					
Retsabal------------	85	Moderate		High	
		Texture/surface depth/rock fragments	0.50	Available water	1.00
108:					
Milok---------------	70	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
Mido, strongly calcareous---------	25	High		High	
		Texture/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
110:					
Bowington-----------	50	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
Radnik--------------	25	Moderate		High	
		Texture/rock fragments	0.50	Available water	1.00
				Soil reaction	0.50
Patterfield---------	20	Low		High	
		Texture/rock fragments	0.10	Salinity	1.00
				Soil reaction	1.00
				Available water	0.50
111:					
Hanksville----------	45	High		High	
		Texture/slope/surface depth/rock fragments	1.00	Salinity	1.00
				Soil reaction	0.50
Persayo-------------	45	Low		Moderate	
				Available water	0.50
				Carbonate content	0.50

Table 12.--Land Management - Damage by Fire and Seedling Mortality--Continued

Map symbol and soil name	Pct. of map unit	Potential for damage to soil by fire: Rating class and limiting features	Value	Potential for seedling mortality: Rating class and limiting features	Value
116:					
Begay, overwash-----	90	Low		High	
		Texture/rock fragments	0.10	Available water	1.00
				Soil reaction	0.50
117:					
Arches--------------	25	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
118:					
Monue---------------	90	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
119:					
Persayo-------------	50	Moderate		Low	
		Texture/surface depth/rock fragments	0.50		
Somorent family-----	40	Moderate		High	
		Texture/rock fragments	0.50	Available water	1.00
				Soil reaction	0.50
126:					
Rizno---------------	60	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
Arches--------------	20	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
Mido----------------	10	High		High	
		Texture/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
127:					
Pocum family--------	95	High		High	
		Texture/rock fragments	1.00	Available water	1.00
				Carbonate content	0.50
				Soil reaction	0.50

Table 12.--Land Management - Damage by Fire and Seedling Mortality--Continued

Map symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
129:					
Milok	75	High		High	
		Texture/surface depth/rock fragments	1.00	Available water	1.00
				Carbonate content	0.50
				Soil reaction	0.50
132:					
Livan family	85	High		High	
		Texture/rock fragments	1.00	Available water	1.00
				Soil reaction	0.50
133:					
Chedeski family	90	Moderate		Moderate	
		Texture/slope/rock fragments	0.50	Available water	0.50
				Soil reaction	0.50

Table 13.--Camp and Picnic Areas

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Camp areas: Rating class and limiting features	Camp areas: Value	Picnic areas: Rating class and limiting features	Picnic areas: Value
80:					
Remorris	85	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Too steep	1.00	Large stones content	1.00
		Large stones content	1.00	Too steep	1.00
		Dusty	0.50	Dusty	0.50
81:					
Moclom	30	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Large stones content	1.00	Large stones content	1.00
		Too sandy	0.68	Too sandy	0.68
		Slope	0.63	Slope	0.63
		Gravel	0.01	Gravel	0.01
Simel	25	Very limited		Very limited	
		Too steep	1.00	Large stones content	1.00
		Large stones content	1.00	Too steep	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00
83:					
Arches	20	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
		Too steep	1.00	Too steep	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00
Pensom	20	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
		Slope	0.01	Slope	0.01
85:					
Mident family	15	Very limited		Very limited	
		Too steep	1.00	Too sandy	1.00
		Depth to bedrock	1.00	Too steep	1.00
		Too sandy	1.00	Depth to bedrock	1.00
Mido	15	Very limited		Very limited	
		Too steep	1.00	Too sandy	1.00
		Too sandy	1.00	Too steep	1.00
86:					
Arches	50	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Slope	0.96	Slope	0.96
		Too sandy	0.92	Too sandy	0.92

Table 13.--Camp and Picnic Areas--Continued

Map symbol and soil name	Pct. of map unit	Camp areas: Rating class and limiting features	Camp areas: Value	Picnic areas: Rating class and limiting features	Picnic areas: Value
87:					
Arches	50	Very limited		Very limited	
		Depth to bedrock	1.00	Too sandy	1.00
		Too sandy	1.00	Depth to bedrock	1.00
		Slope	0.16	Slope	0.16
88:					
Crosscan family	75	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Slope	0.84	Slope	0.84
		Gravel	0.26	Gravel	0.26
		Too sandy	0.18	Too sandy	0.18
89:					
Reef	40	Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Too sandy	0.24	Too sandy	0.24
91:					
Mido	80	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
		Too steep	1.00	Too steep	1.00
Mido, strongly calcareous	15	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
		Slope	0.16	Slope	0.16
100:					
Arches	35	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Too sandy	0.98	Too sandy	0.98
		Slope	0.04	Slope	0.04
Rizno	30	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Large stones content	0.76	Large stones content	0.76
		Too sandy	0.50	Too sandy	0.50
		Slope	0.01	Slope	0.01
103:					
Mido, strongly calcareous	80	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
Mido	15	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
106:					
Retsabal	85	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Dusty	0.50	Dusty	0.50

Table 13.--Camp and Picnic Areas--Continued

Map symbol and soil name	Pct. of map unit	Camp areas: Rating class and limiting features	Camp areas: Value	Picnic areas: Rating class and limiting features	Picnic areas: Value
108:					
Milok----------------	70	Somewhat limited		Somewhat limited	
		Too sandy	0.92	Too sandy	0.92
Mido, strongly calcareous---------	25	Somewhat limited		Somewhat limited	
		Slope	0.84	Slope	0.84
		Too sandy	0.76	Too sandy	0.76
110:					
Bowington-----------	50	Very limited		Very limited	
		Flooding	1.00	Too sandy	1.00
		Too sandy	1.00	Flooding	0.40
		Depth to saturated zone	0.28	Depth to saturated zone	0.14
Radnik--------------	25	Very limited		Very limited	
		Flooding	1.00	Too sandy	1.00
		Too sandy	1.00		
Patterfield---------	20	Very limited		Very limited	
		Sodium content	1.00	Sodium content	1.00
		Salinity	1.00	Salinity	1.00
		Flooding	1.00		
111:					
Hanksville----------	45	Very limited		Very limited	
		Too steep	1.00	Too steep	1.00
		Sodium content	1.00	Sodium content	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Slow water movement	0.41	Slow water movement	0.41
		Salinity	0.13	Salinity	0.13
Persayo-------------	45	Very limited		Very limited	
		Too steep	1.00	Too steep	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00
116:					
Begay, overwash-----	90	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
117:					
Arches--------------	25	Very limited		Very limited	
		Depth to bedrock	1.00	Too sandy	1.00
		Too sandy	1.00	Depth to bedrock	1.00
118:					
Monue---------------	90	Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00
		Too sandy	0.88	Too sandy	0.88
		Gravel	0.01	Gravel	0.01

Table 13.--Camp and Picnic Areas--Continued

Map symbol and soil name	Pct. of map unit	Camp areas: Rating class and limiting features	Camp areas: Value	Picnic areas: Rating class and limiting features	Picnic areas: Value
119:					
Persayo-------------	50	Very limited		Very limited	
		Too steep	1.00	Too steep	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Dusty	0.50	Dusty	0.50
Somorent family-----	40	Very limited		Very limited	
		Too steep	1.00	Too steep	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Gravel	0.61	Gravel	0.61
126:					
Rizno---------------	60	Very limited		Very limited	
		Depth to bedrock	1.00	Too sandy	1.00
		Too sandy	1.00	Depth to bedrock	1.00
Arches--------------	20	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00
Mido----------------	10	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
		Slope	0.16	Slope	0.16
127:					
Pocum family--------	95	Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Too sandy	0.76	Too sandy	0.76
129:					
Milok---------------	75	Very limited		Very limited	
		Gravel	1.00	Gravel	1.00
		Too sandy	0.24	Too sandy	0.24
132:					
Livan family--------	85	Very limited		Very limited	
		Flooding	1.00	Too sandy	1.00
		Too sandy	1.00		
133:					
Chedeski family-----	90	Very limited		Very limited	
		Too steep	1.00	Large stones content	1.00
		Large stones content	1.00	Too steep	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Gravel	0.68	Gravel	0.68

Table 14.--Trail Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails: Rating class and limiting features	Value	Mountain bike and off-road vehicle trails: Rating class and limiting features	Value
80:					
Remorris	85	Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00
		Water erosion	1.00	Water erosion	1.00
		Slope	0.82	Dusty	0.50
		Dusty	0.50		
81:					
Moclom	30	Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00
		Too sandy	0.68	Too sandy	0.68
Simel	25	Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00
		Slope	1.00	Slope	0.22
83:					
Arches	20	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
Pensom	20	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
85:					
Mident family	15	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
		Slope	1.00		
Mido	15	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
		Slope	0.82		
86:					
Arches	50	Somewhat limited		Somewhat limited	
		Too sandy	0.92	Too sandy	0.92
87:					
Arches	50	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
88:					
Crosscan family	75	Somewhat limited		Somewhat limited	
		Too sandy	0.18	Too sandy	0.18
89:					
Reef	40	Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00
		Too sandy	0.24	Too sandy	0.24
91:					
Mido	80	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
		Slope	0.50		

Table 14.--Trail Management--Continued

Map symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails: Rating class and limiting features	Value	Mountain bike and off-road vehicle trails: Rating class and limiting features	Value
91:					
Mido, strongly calcareous-------------	15	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
100:					
Arches------------------	35	Somewhat limited		Somewhat limited	
		Too sandy	0.98	Too sandy	0.98
Rizno-------------------	30	Somewhat limited		Somewhat limited	
		Large stones content	0.76	Large stones content	0.76
		Too sandy	0.50	Too sandy	0.50
103:					
Mido, strongly calcareous-------------	80	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
Mido--------------------	15	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
106:					
Retsabal----------------	85	Somewhat limited		Somewhat limited	
		Dusty	0.50	Dusty	0.50
108:					
Milok-------------------	70	Somewhat limited		Somewhat limited	
		Too sandy	0.92	Too sandy	0.92
Mido, strongly calcareous-------------	25	Somewhat limited		Somewhat limited	
		Too sandy	0.76	Too sandy	0.76
110:					
Bowington---------------	50	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
		Flooding	0.40	Flooding	0.40
Radnik------------------	25	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
Patterfield-------------	20	Not limited		Not limited	
111:					
Hanksville--------------	45	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Water erosion	1.00	Water erosion	1.00
Persayo-----------------	45	Very limited		Very limited	
		Slope	1.00	Slope	1.00
116:					
Begay, overwash---------	90	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00

Table 14.--Trail Management--Continued

Map symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails: Rating class and limiting features	Value	Mountain bike and off-road vehicle trails: Rating class and limiting features	Value
117:					
Arches	25	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
118:					
Monue	90	Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00
		Too sandy	0.88	Too sandy	0.88
119:					
Persayo	50	Very limited		Very limited	
		Water erosion	1.00	Water erosion	1.00
		Slope	1.00	Dusty	0.50
		Dusty	0.50		
Somorent family	40	Not limited		Not limited	
126:					
Rizno	60	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
Arches	20	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
Mido	10	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
127:					
Pocum family	95	Somewhat limited		Somewhat limited	
		Too sandy	0.76	Too sandy	0.76
129:					
Milok	75	Somewhat limited		Somewhat limited	
		Too sandy	0.24	Too sandy	0.24
132:					
Livan family	85	Very limited		Very limited	
		Too sandy	1.00	Too sandy	1.00
133:					
Chedeski family	90	Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00
		Slope	1.00	Slope	1.00

Table 15.--Dwellings and Small Commercial Buildings

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
80:							
Remorris------------	85	Very limited		Very limited		Very limited	
		Too steep	1.00	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Depth to soft bedrock	0.50	Too steep	1.00	Slope	1.00
81:							
Moclom--------------	30	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.63	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Depth to soft bedrock	0.50	Slope	0.63	Slope	1.00
Simel---------------	25	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Too steep	1.00	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Shrink-swell	0.50	Too steep	1.00	Slope	1.00
		Depth to soft bedrock	0.50	Shrink-swell	0.50	Shrink-swell	0.50
83:							
Arches--------------	20	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Too steep	1.00	Too steep	1.00	Slope	1.00
Pensom--------------	20	Somewhat limited		Very limited		Very limited	
		Depth to hard bedrock	0.68	Depth to hard bedrock	1.00	Slope	1.00
		Slope	0.01	Slope	0.01	Depth to hard bedrock	0.68
85:							
Mident family-------	15	Very limited		Very limited		Very limited	
		Too steep	1.00	Too steep	1.00	Slope	1.00
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Depth to soft bedrock	0.50	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
Mido----------------	15	Very limited		Very limited		Very limited	
		Too steep	1.00	Too steep	1.00	Slope	1.00
86:							
Arches--------------	50	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.96	Slope	0.96	Slope	1.00

Table 15.--Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
87:							
Arches--------------	50	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.16	Slope	0.16	Slope	1.00
88:							
Crosscan family-----	75	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.84	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Depth to soft bedrock	0.50	Slope	0.84	Slope	1.00
89:							
Reef----------------	40	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Large stones	0.60	Large stones	0.60	Large stones	0.60
						Slope	0.12
91:							
Mido----------------	80	Very limited		Very limited		Very limited	
		Too steep	1.00	Too steep	1.00	Slope	1.00
Mido, strongly calcareous---------	15	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.16	Slope	0.16	Slope	1.00
100:							
Arches--------------	35	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.04	Slope	0.04	Slope	1.00
Rizno---------------	30	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.01	Slope	0.01	Slope	1.00
103:							
Mido, strongly calcareous---------	80	Not limited		Not limited		Somewhat limited	
						Slope	0.50
Mido----------------	15	Not limited		Not limited		Not limited	
106:							
Retsabal------------	85	Somewhat limited		Very limited		Somewhat limited	
		Depth to soft bedrock	0.50	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00

Table 15.--Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
108:							
Milok	70	Not limited		Not limited		Not limited	
Mido, strongly calcareous	25	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.84	Slope	0.84	Slope	1.00
110:							
Bowington	50	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	0.28	Depth to saturated zone	1.00	Depth to saturated zone	0.28
Radnik	25	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
Patterfield	20	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
111:							
Hanksville	45	Very limited		Very limited		Very limited	
		Too steep	1.00	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Shrink-swell	0.50	Too steep	1.00	Slope	1.00
		Depth to soft bedrock	0.50	Shrink-swell	0.50	Shrink-swell	0.50
Persayo	45	Very limited		Very limited		Very limited	
		Too steep	1.00	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Shrink-swell	0.50	Too steep	1.00	Slope	1.00
		Depth to soft bedrock	0.50	Shrink-swell	0.50	Shrink-swell	0.50
116:							
Begay, overwash	90	Not limited		Not limited		Not limited	
117:							
Arches	25	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Depth to soft bedrock	0.50	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
						Slope	0.50
118:							
Monue	90	Not limited		Not limited		Not limited	
119:							
Persayo	50	Very limited		Very limited		Very limited	
		Too steep	1.00	Too steep	1.00	Slope	1.00
		Shrink-swell	0.50	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Depth to soft bedrock	0.50	Shrink-swell	0.50	Shrink-swell	0.50

Table 15.--Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
119:							
Somorent family	40	Very limited		Very limited		Very limited	
		Too steep	1.00	Too steep	1.00	Slope	1.00
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Depth to soft bedrock	0.50	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
126:							
Rizno	60	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Depth to soft bedrock	0.50	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
						Slope	0.50
Arches	20	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
Mido	10	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.16	Slope	0.16	Slope	1.00
127:							
Pocum family	95	Somewhat limited		Very limited		Somewhat limited	
		Depth to hard bedrock	0.95	Depth to hard bedrock	1.00	Depth to hard bedrock	0.95
129:							
Milok	75	Not limited		Not limited		Somewhat limited	
						Slope	0.88
132:							
Livan family	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
133:							
Chedeski family	90	Very limited		Very limited		Very limited	
		Too steep	1.00	Too steep	1.00	Slope	1.00
		Shrink-swell	0.50	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Depth to soft bedrock	0.50	Shrink-swell	0.50	Shrink-swell	0.50

Table 16.--Roads and Streets and Shallow Excavations

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations	
		Rating class and limiting features	Value	Rating class and limiting features	Value
80:					
Remorris	85	Very limited		Very limited	
		Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Too steep	1.00	Too steep	1.00
		Frost action	0.50		
81:					
Moclom	30	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Slope	0.63	Slope	0.63
Simel	25	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Too steep	1.00	Too steep	1.00
		Shrink-swell	0.50		
		Frost action	0.50		
83:					
Arches	20	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Too steep	1.00	Too steep	1.00
				Cutbanks cave	0.10
Pensom	20	Somewhat limited		Very limited	
		Depth to hard bedrock	0.68	Depth to hard bedrock	1.00
		Slope	0.01	Cutbanks cave	1.00
				Slope	0.01
85:					
Mident family	15	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Too steep	1.00	Depth to soft bedrock	1.00
		Depth to soft bedrock	1.00	Too steep	1.00
Mido	15	Very limited		Very limited	
		Too steep	1.00	Too steep	1.00
				Cutbanks cave	1.00

Table 16.--Roads and Streets and Shallow Excavations--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets: Rating class and limiting features	Local roads and streets: Value	Shallow excavations: Rating class and limiting features	Shallow excavations: Value
86:					
Arches	50	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.96	Slope	0.96
				Cutbanks cave	0.10
87:					
Arches	50	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.16	Slope	0.16
				Cutbanks cave	0.10
88:					
Crosscan family	75	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Slope	0.84	Slope	0.84
		Frost action	0.50		
89:					
Reef	40	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Large stones	0.60	Large stones	0.60
		Frost action	0.50		
91:					
Mido	80	Very limited		Very limited	
		Too steep	1.00	Cutbanks cave	1.00
				Too steep	1.00
Mido, strongly calcareous	15	Somewhat limited		Very limited	
		Slope	0.16	Cutbanks cave	1.00
				Slope	0.16
100:					
Arches	35	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.04	Slope	0.04
Rizno	30	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Frost action	0.50	Slope	0.01
		Slope	0.01		
103:					
Mido, strongly calcareous	80	Not limited		Very limited	
				Cutbanks cave	1.00

Table 16.--Roads and Streets and Shallow Excavations--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations	
		Rating class and limiting features	Value	Rating class and limiting features	Value
103:					
Mido----------------	15	Not limited		Very limited	
				Cutbanks cave	1.00
106:					
Retsabal------------	85	Somewhat limited		Very limited	
		Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Frost action	0.50		
108:					
Milok---------------	70	Somewhat limited		Very limited	
		Frost action	0.50	Cutbanks cave	1.00
Mido, strongly calcareous---------	25	Somewhat limited		Very limited	
		Slope	0.84	Cutbanks cave	1.00
				Slope	0.84
110:					
Bowington-----------	50	Very limited		Very limited	
		Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	0.14	Cutbanks cave	1.00
				Flooding	0.80
Radnik--------------	25	Very limited		Very limited	
		Flooding	1.00	Cutbanks cave	1.00
				Flooding	0.60
Patterfield---------	20	Somewhat limited		Somewhat limited	
		Frost action	0.50	Cutbanks cave	0.10
		Flooding	0.20		
111:					
Hanksville----------	45	Very limited		Very limited	
		Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Low strength	1.00	Too steep	1.00
		Too steep	1.00	Cutbanks cave	0.10
		Shrink-swell	0.50		
		Frost action	0.50		
Persayo-------------	45	Very limited		Very limited	
		Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Low strength	1.00	Too steep	1.00
		Too steep	1.00		
		Shrink-swell	0.50		
		Frost action	0.50		
116:					
Begay, overwash-----	90	Somewhat limited		Somewhat limited	
		Frost action	0.50	Cutbanks cave	0.10

Table 16.--Roads and Streets and Shallow Excavations--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value
117:					
Arches--------------	25	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
118:					
Monue---------------	90	Somewhat limited		Very limited	
		Frost action	0.50	Cutbanks cave	1.00
119:					
Persayo-------------	50	Very limited		Very limited	
		Too steep	1.00	Depth to soft bedrock	1.00
		Depth to soft bedrock	1.00	Too steep	1.00
		Low strength	1.00	Cutbanks cave	0.10
		Shrink-swell	0.50		
		Frost action	0.50		
Somorent family-----	40	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Too steep	1.00	Depth to soft bedrock	1.00
		Depth to soft bedrock	1.00	Too steep	1.00
		Frost action	0.50		
126:					
Rizno---------------	60	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Frost action	0.50		
Arches--------------	20	Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
				Cutbanks cave	0.10
Mido----------------	10	Somewhat limited		Very limited	
		Slope	0.16	Cutbanks cave	1.00
				Slope	0.16
127:					
Pocum family--------	95	Somewhat limited		Very limited	
		Depth to hard bedrock	0.95	Depth to hard bedrock	1.00
		Frost action	0.50	Dense layer	0.50

Table 16.--Roads and Streets and Shallow Excavations--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations	
		Rating class and limiting features	Value	Rating class and limiting features	Value
129:					
Milok---------------	75	Somewhat limited		Very limited	
		Frost action	0.50	Cutbanks cave	1.00
132:					
Livan family--------	85	Very limited		Very limited	
		Flooding	1.00	Cutbanks cave	1.00
				Flooding	0.60
133:					
Chedeski family-----	90	Very limited		Very limited	
		Too steep	1.00	Depth to soft bedrock	1.00
		Depth to soft bedrock	1.00	Too steep	1.00
		Shrink-swell	0.50	Cutbanks cave	0.10
		Frost action	0.50		

Table 17.--Sewage Disposal

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
80:					
Remorris------------	85	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to soft bedrock	1.00
		Too steep	1.00	Slope	1.00
81:					
Moclom--------------	30	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.63	Depth to soft bedrock	1.00
				Slope	1.00
Simel---------------	25	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Too steep	1.00	Depth to soft bedrock	1.00
				Slope	1.00
83:					
Arches--------------	20	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Too steep	1.00	Seepage	1.00
				Slope	1.00
Pensom--------------	20	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Filtering capacity	1.00	Seepage	1.00
		Slope	0.01	Slope	1.00
85:					
Mident family-------	15	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Too steep	1.00	Depth to soft bedrock	1.00
				Slope	1.00
Mido----------------	15	Very limited		Very limited	
		Too steep	1.00	Slope	1.00
		Filtering capacity	1.00	Seepage	1.00

Table 17.--Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
86:					
Arches	50	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.96	Slope	1.00
87:					
Arches	50	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.16	Seepage	1.00
				Slope	1.00
88:					
Crosscan family	75	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.84	Depth to soft bedrock	1.00
				Slope	1.00
89:					
Reef	40	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Large stones	0.60	Slope	0.68
91:					
Mido	80	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Too steep	1.00	Slope	1.00
		Depth to bedrock	0.27		
Mido, strongly calcareous	15	Somewhat limited		Very limited	
		Depth to bedrock	0.25	Seepage	1.00
		Slope	0.16	Slope	1.00
100:					
Arches	35	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.04	Slope	1.00
Rizno	30	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.01	Slope	1.00
103:					
Mido, strongly calcareous	80	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
				Slope	0.92

Table 17.--Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
103:					
Mido	15	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
				Slope	0.08
106:					
Retsabal	85	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to soft bedrock	1.00
				Seepage	1.00
				Slope	0.08
108:					
Milok	70	Not limited		Very limited	
				Seepage	1.00
				Slope	0.08
Mido, strongly calcareous	25	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Slope	0.84	Slope	1.00
110:					
Bowington	50	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Seepage	1.00
		Filtering capacity	1.00	Depth to saturated zone	1.00
Radnik	25	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Filtering capacity	1.00	Seepage	1.00
Patterfield	20	Very limited		Very limited	
		Slow water movement	1.00	Seepage	1.00
		Flooding	0.20	Flooding	0.20
				Slope	0.08
111:					
Hanksville	45	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to soft bedrock	1.00
		Too steep	1.00	Slope	1.00
Persayo	45	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to soft bedrock	1.00
		Too steep	1.00	Slope	1.00
116:					
Begay, overwash	90	Not limited		Very limited	
				Seepage	1.00

Table 17.--Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
117:					
Arches--------------	25	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
				Depth to soft bedrock	1.00
				Slope	0.92
118:					
Monue---------------	90	Not limited		Very limited	
				Seepage	1.00
				Slope	0.32
119:					
Persayo-------------	50	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to soft bedrock	1.00
		Too steep	1.00	Slope	1.00
Somorent family-----	40	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Too steep	1.00	Depth to soft bedrock	1.00
				Slope	1.00
126:					
Rizno---------------	60	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
				Depth to soft bedrock	1.00
				Seepage	1.00
				Slope	0.92
Arches--------------	20	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
				Slope	0.32
Mido----------------	10	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Slope	0.16	Slope	1.00
127:					
Pocum family--------	95	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
				Seepage	1.00
129:					
Milok---------------	75	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
				Slope	1.00

Table 17.--Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
132:					
Livan family--------	85	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Filtering capacity	1.00	Seepage	1.00
133:					
Chedeski family-----	90	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to soft bedrock	1.00
		Too steep	1.00	Slope	1.00

Table 18.--Source of Gravel and Sand

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The ratings given for the thickest layer are for the thickest layer above and excluding the bottom layer. The numbers in the value columns range from 0.00 to 0.99. The greater the value, the greater the likelihood that the bottom layer or thickest layer of the soil is a source of sand or gravel. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
80:					
Remorris	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
81:					
Moclom	30	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.10
Simel	25	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
83:					
Arches	20	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.08
Pensom	20	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.16
		Bottom layer	0.00	Bottom layer	0.30
85:					
Mident family	15	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.23
Mido	15	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.27
		Thickest layer	0.00	Bottom layer	0.30
86:					
Arches	50	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.08
87:					
Arches	50	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.27
88:					
Crosscan family	75	Poor		Poor	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.00

Table 18.--Source of Gravel and Sand--Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
89:					
Reef----------------	40	Fair		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.03	Bottom layer	0.03
91:					
Mido----------------	80	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.35
		Bottom layer	0.00	Bottom layer	0.35
Mido, strongly calcareous---------	15	Poor		Fair	
		Bottom layer	0.00	Bottom layer	0.27
		Thickest layer	0.00	Thickest layer	0.68
100:					
Arches--------------	35	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.20
Rizno---------------	30	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.03
103:					
Mido, strongly calcareous---------	80	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.04
		Bottom layer	0.00	Bottom layer	0.27
Mido----------------	15	Poor		Fair	
		Thickest layer	0.00	Bottom layer	0.06
		Bottom layer	0.00	Thickest layer	0.23
106:					
Retsabal------------	85	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.05
108:					
Milok---------------	70	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.20
Mido, strongly calcareous---------	25	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.05
		Bottom layer	0.00	Bottom layer	0.23
110:					
Bowington-----------	50	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.43
		Thickest layer	0.00	Bottom layer	0.66
Radnik--------------	25	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.50
		Thickest layer	0.00	Bottom layer	0.82

Table 18.--Source of Gravel and Sand--Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel: Rating class	Value	Potential source of sand: Rating class	Value
110:					
Patterfield	20	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
111:					
Hanksville	45	Poor		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
Persayo	45	Poor		Poor	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.00
116:					
Begay, overwash	90	Poor		Poor	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.00
117:					
Arches	25	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.14
118:					
Monue	90	Not rated		Not rated	
119:					
Persayo	50	Poor		Poor	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.00
Somorent family	40	Poor		Poor	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.00
126:					
Rizno	60	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.03
Arches	20	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.40
Mido	10	Poor		Fair	
		Thickest layer	0.00	Thickest layer	0.40
		Bottom layer	0.00	Bottom layer	0.40
127:					
Pocum family	95	Poor		Fair	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.04
129:					
Milok	75	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.10
		Thickest layer	0.00	Bottom layer	0.38

Table 18.--Source of Gravel and Sand--Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
132:					
Livan family--------	85	Fair		Fair	
		Thickest layer	0.00	Bottom layer	0.15
		Bottom layer	0.53	Thickest layer	0.66
133:					
Chedeski family-----	90	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.00
		Thickest layer	0.00	Bottom layer	0.02

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.00 to 0.99. The smaller the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material: Rating class and limiting features	Value	Potential source of roadfill: Rating class and limiting features	Value	Potential source of topsoil: Rating class and limiting features	Value
80:							
Remorris	85	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Depth to bedrock	0.00
		Depth to bedrock	0.00	Slope	0.18	Slope	0.00
		Carbonate content	0.97			Rock fragments	0.82
		Water erosion	0.99			Carbonate content	0.97
81:							
Moclom	30	Poor		Poor		Poor	
		Depth to bedrock	0.00	Depth to bedrock	0.00	Depth to bedrock	0.00
		Wind erosion	0.00			Rock fragments	0.08
		Droughty	0.00			Too sandy	0.08
		Too sandy	0.08			Slope	0.37
		Organic matter content low	0.88				
Simel	25	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Slope	0.00
		Depth to bedrock	0.00	Slope	0.00	Depth to bedrock	0.00
		Too clayey	0.18			Too clayey	0.12
		Organic matter content low	0.50				
		Water erosion	0.99				
83:							
Arches	20	Poor		Poor		Poor	
		Wind erosion	0.00	Depth to bedrock	0.00	Too sandy	0.00
		Droughty	0.00			Slope	0.00
		Too sandy	0.00			Depth to bedrock	0.00
		Depth to bedrock	0.00				
		Organic matter content low	0.50				
Pensom	20	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Too sandy	0.00
		Wind erosion	0.00			Depth to bedrock	0.32
		Too sandy	0.00				
		Depth to bedrock	0.32				
		Organic matter content low	0.50				
85:							
Mident family	15	Poor		Poor		Poor	
		Too sandy	0.00	Slope	0.00	Slope	0.00
		Wind erosion	0.00	Depth to bedrock	0.00	Too sandy	0.00
		Droughty	0.00			Depth to bedrock	0.00
		Depth to bedrock	0.00				
		Organic matter content low	0.50				

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
85:							
Mido	15	Poor		Fair		Poor	
		Too sandy	0.00	Slope	0.18	Too sandy	0.00
		Too alkaline	0.00			Slope	0.00
		Wind erosion	0.00				
		Organic matter content low	0.12				
		Droughty	0.68				
86:							
Arches	50	Poor		Poor		Poor	
		Too sandy	0.00	Depth to bedrock	0.00	Depth to bedrock	0.00
		Wind erosion	0.00			Too sandy	0.00
		Droughty	0.00			Slope	0.04
		Depth to bedrock	0.00				
87:							
Arches	50	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Depth to bedrock	0.00
		Wind erosion	0.00			Too sandy	0.00
		Depth to bedrock	0.00			Slope	0.84
		Too sandy	0.00				
		Organic matter content low	0.50				
88:							
Crosscan family	75	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Rock fragments	0.00
		Depth to bedrock	0.00			Depth to bedrock	0.00
		Organic matter content low	0.50			Slope	0.16
89:							
Reef	40	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Rock fragments	0.00
		Depth to bedrock	0.00	Stones	0.99	Depth to bedrock	0.00
		Stone content	0.36			Too sandy	0.44
		Too sandy	0.44				
		Organic matter content low	0.50				
		Cobble content	0.97				
91:							
Mido	80	Poor		Fair		Poor	
		Wind erosion	0.00	Slope	0.50	Too sandy	0.00
		Too sandy	0.00			Slope	0.00
		Droughty	0.08				
		Organic matter content low	0.12				
Mido, strongly calcareous	15	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Wind erosion	0.00			Slope	0.84
		Too alkaline	0.00				
		Droughty	0.10				
		Organic matter content low	0.12				

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material: Rating class and limiting features	Value	Potential source of roadfill: Rating class and limiting features	Value	Potential source of topsoil: Rating class and limiting features	Value
100:							
Arches-------------	35	Poor		Poor		Poor	
		Too sandy	0.00	Depth to bedrock	0.00	Too sandy	0.00
		Depth to bedrock	0.00			Depth to bedrock	0.00
		Droughty	0.00			Slope	0.96
		Wind erosion	0.00				
		Organic matter content low	0.50				
Rizno---------------	30	Poor		Poor		Poor	
		Wind erosion	0.00	Depth to bedrock	0.00	Depth to bedrock	0.00
		Droughty	0.00				
		Depth to bedrock	0.00				
		Organic matter content low	0.12				
		Water erosion	0.99				
103:							
Mido, strongly calcareous---------	80	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Wind erosion	0.00				
		Too alkaline	0.00				
		Organic matter content low	0.12				
		Droughty	0.97				
Mido----------------	15	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Too alkaline	0.00				
		Wind erosion	0.00				
		Organic matter content low	0.12				
106:							
Retsabal------------	85	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Depth to bedrock	0.00
		Depth to bedrock	0.00			Too sandy	0.99
		Organic matter content low	0.12				
		Water erosion	0.37				
		Too sandy	0.99				
108:							
Milok---------------	70	Poor		Good		Poor	
		Too alkaline	0.00			Too sandy	0.00
		Wind erosion	0.00				
		Too sandy	0.00				
		Organic matter content low	0.12				
		Water erosion	0.68				

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material: Rating class and limiting features	Value	Potential source of roadfill: Rating class and limiting features	Value	Potential source of topsoil: Rating class and limiting features	Value
108:							
Mido, strongly calcareous	25	Poor		Good		Fair	
		Too alkaline	0.00			Too sandy	0.14
		Wind erosion	0.00			Slope	0.16
		Too sandy	0.14				
		Organic matter content low	0.50				
110:							
Bowington	50	Poor		Fair		Poor	
		Wind erosion	0.00	Wetness depth	0.59	Too sandy	0.00
		Too sandy	0.00			Wetness depth	0.59
		Droughty	0.23				
		Water erosion	0.37				
		Organic matter content low	0.88				
Radnik	25	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Too alkaline	0.00				
		Wind erosion	0.00				
		Organic matter content low	0.50				
		Droughty	0.80				
Patterfield	20	Poor		Good		Poor	
		Sodium content	0.00			Salinity	0.00
		Salinity	0.00			Sodium content	0.22
		Too alkaline	0.00				
		Organic matter content low	0.50				
111:							
Hanksville	45	Poor		Poor		Poor	
		Too alkaline	0.00	Low strength	0.00	Slope	0.00
		Sodium content	0.00	Depth to bedrock	0.00	Salinity	0.00
		Droughty	0.00	Slope	0.00	Sodium content	0.00
		Depth to bedrock	0.00	Shrink-swell	0.87	Depth to bedrock	0.00
		Too clayey	0.08			Too clayey	0.05
		Salinity	0.50				
		Organic matter content low	0.50				
		Water erosion	0.90				
Persayo	45	Poor		Poor		Poor	
		Droughty	0.00	Slope	0.00	Slope	0.00
		Depth to bedrock	0.00	Low strength	0.00	Depth to bedrock	0.00
		Organic matter content low	0.50	Depth to bedrock	0.00	Too clayey	0.44
		Too clayey	0.68			Rock fragments	0.76
		Carbonate content	0.99				
116:							
Begay, overwash	90	Poor		Good		Good	
		Wind erosion	0.00				
		Organic matter content low	0.50				

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material: Rating class and limiting features	Value	Potential source of roadfill: Rating class and limiting features	Value	Potential source of topsoil: Rating class and limiting features	Value
117:							
Arches	25	Poor		Poor		Poor	
		Depth to bedrock	0.00	Depth to bedrock	0.00	Too sandy	0.00
		Droughty	0.00			Depth to bedrock	0.00
		Wind erosion	0.00				
		Too sandy	0.00				
		Organic matter content low	0.88				
118:							
Monue	90	Poor		Good		Fair	
		Organic matter content low	0.00			Too sandy	0.78
		Too alkaline	0.00			Rock fragments	0.88
		Wind erosion	0.00				
		Droughty	0.32				
		Too sandy	0.78				
119:							
Persayo	50	Poor		Poor		Poor	
		Depth to bedrock	0.00	Depth to bedrock	0.00	Slope	0.00
		Droughty	0.00	Slope	0.00	Depth to bedrock	0.00
		Organic matter content low	0.50	Low strength	0.00		
		Water erosion	0.90	Shrink-swell	0.87		
Somorent family	40	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Rock fragments	0.00
		Depth to bedrock	0.00			Slope	0.00
		Organic matter content low	0.88			Depth to bedrock	0.00
126:							
Rizno	60	Poor		Poor		Poor	
		Wind erosion	0.00	Depth to bedrock	0.00	Depth to bedrock	0.00
		Droughty	0.00			Too sandy	0.78
		Depth to bedrock	0.00			Rock fragments	0.88
		Water erosion	0.06				
		Organic matter content low	0.12				
		Too sandy	0.78				
Arches	20	Poor		Poor		Poor	
		Too sandy	0.00	Depth to bedrock	0.00	Too sandy	0.00
		Wind erosion	0.00			Depth to bedrock	0.00
		Droughty	0.00				
		Depth to bedrock	0.00				
		Organic matter content low	0.50				
Mido	10	Poor		Good		Poor	
		Wind erosion	0.00			Too sandy	0.00
		Too sandy	0.00			Slope	0.84
		Organic matter content low	0.12				
		Droughty	0.46				

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material: Rating class and limiting features	Value	Potential source of roadfill: Rating class and limiting features	Value	Potential source of topsoil: Rating class and limiting features	Value
127:							
Pocum family	95	Poor		Poor		Poor	
		Wind erosion	0.00	Depth to cemented pan	0.00	Depth to cemented pan	0.00
		Carbonate content	0.00	Depth to bedrock	0.00	Rock fragments	0.00
		Depth to cemented pan	0.00			Depth to bedrock	0.05
		Droughty	0.00			Carbonate content	0.99
		Depth to bedrock	0.05				
		Organic matter content low	0.50				
		Water erosion	0.99				
129:							
Milok	75	Poor		Good		Poor	
		Too sandy	0.00			Rock fragments	0.00
		Carbonate content	0.32			Too sandy	0.00
		Organic matter content low	0.50			Carbonate content	0.99
		Droughty	0.76				
132:							
Livan family	85	Poor		Good		Poor	
		Wind erosion	0.00			Hard to reclaim (rock fragments)	0.00
		Too sandy	0.00			Too sandy	0.00
		Droughty	0.02				
		Organic matter content low	0.50				
		Carbonate content	0.97				
133:							
Chedeski family	90	Poor		Poor		Poor	
		Depth to bedrock	0.00	Depth to bedrock	0.00	Depth to bedrock	0.00
		Droughty	0.00	Slope	0.00	Slope	0.00
		Organic matter content low	0.12	Shrink-swell	0.87	Rock fragments	0.59

Table 20.--Ponds and Embankments

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
80:							
Remorris------------	85	Very limited		Very limited		Very limited	
		Slope	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to bedrock	0.97	Piping	0.18		
		Seepage	0.03				
81:							
Moclom--------------	30	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Seepage	1.00	Depth to water	1.00
		Slope	1.00	Thin layer	1.00		
Simel---------------	25	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Slope	1.00				
83:							
Arches--------------	20	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Seepage	1.00	Depth to water	1.00
		Slope	1.00	Thin layer	1.00		
Pensom--------------	20	Very limited		Very limited		Very limited	
		Seepage	1.00	Seepage	1.00	Depth to water	1.00
		Slope	1.00	Thin layer	0.92		
		Depth to bedrock	0.92				
85:							
Mident family-------	15	Very limited		Very limited		Very limited	
		Slope	1.00	Seepage	1.00	Depth to water	1.00
		Depth to bedrock	1.00	Thin layer	1.00		
Mido----------------	15	Very limited		Very limited		Very limited	
		Seepage	1.00	Seepage	1.00	Depth to water	1.00
		Slope	1.00				
86:							
Arches--------------	50	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Slope	1.00				
87:							
Arches--------------	50	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Seepage	1.00	Depth to water	1.00
		Slope	1.00	Thin layer	1.00		
88:							
Crosscan family-----	75	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Slope	1.00				
89:							
Reef----------------	40	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Slope	0.32	Large stones	0.60		

Table 20.--Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
91:							
Mido----------------	80	Very limited		Very limited		Very limited	
		Seepage	1.00	Seepage	1.00	Depth to water	1.00
		Slope	1.00				
Mido, strongly calcareous---------	15	Very limited		Very limited		Very limited	
		Seepage	1.00	Seepage	1.00	Depth to water	1.00
		Slope	1.00				
100:							
Arches--------------	35	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Slope	1.00				
Rizno---------------	30	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Slope	1.00				
103:							
Mido, strongly calcareous---------	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.85	Depth to water	1.00
		Slope	0.68				
Mido----------------	15	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.30	Depth to water	1.00
106:							
Retsabal------------	85	Somewhat limited		Very limited		Very limited	
		Depth to bedrock	0.75	Piping	1.00	Depth to water	1.00
		Seepage	0.03	Thin layer	1.00		
108:							
Milok---------------	70	Very limited		Not limited		Very limited	
		Seepage	1.00			Depth to water	1.00
Mido, strongly calcareous---------	25	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.43	Depth to water	1.00
		Slope	1.00				
110:							
Bowington-----------	50	Very limited		Very limited		Very limited	
		Seepage	1.00	Seepage	1.00	Cutbanks cave	1.00
				Depth to saturated zone	0.99	Depth to saturated zone	0.01
Radnik--------------	25	Very limited		Very limited		Very limited	
		Seepage	1.00	Seepage	1.00	Depth to water	1.00
Patterfield---------	20	Very limited		Very limited		Very limited	
		Seepage	1.00	Salinity	1.00	Depth to water	1.00
				Piping	1.00		

Table 20.--Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
111:							
Hanksville	45	Very limited		Very limited		Very limited	
		Slope	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to bedrock	0.49	Piping	1.00		
		Seepage	0.03	Salinity	0.50		
Persayo	45	Very limited		Very limited		Very limited	
		Slope	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to bedrock	0.90	Piping	0.04		
116:							
Begay, overwash	90	Very limited		Not limited		Very limited	
		Seepage	1.00			Depth to water	1.00
117:							
Arches	25	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Seepage	1.00	Depth to water	1.00
		Slope	0.68	Thin layer	1.00		
118:							
Monue	90	Very limited		Very limited		Very limited	
		Seepage	1.00	Seepage	1.00	Depth to water	1.00
		Slope	0.08				
119:							
Persayo	50	Very limited		Very limited		Very limited	
		Slope	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to bedrock	0.63	Piping	0.01		
		Seepage	0.03				
Somorent family	40	Very limited		Very limited		Very limited	
		Slope	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to bedrock	1.00				
126:							
Rizno	60	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Slope	0.68				
Arches	20	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Seepage	1.00	Depth to water	1.00
		Slope	0.08	Thin layer	1.00		
Mido	10	Very limited		Very limited		Very limited	
		Seepage	1.00	Seepage	1.00	Depth to water	1.00
		Slope	1.00				
127:							
Pocum family	95	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to bedrock	0.99	Seepage	0.58		
129:							
Milok	75	Very limited		Very limited		Very limited	
		Seepage	1.00	Seepage	1.00	Depth to water	1.00
		Slope	0.92				

Table 20.--Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
132:							
Livan family--------	85	Very limited		Very limited		Very limited	
		Seepage	1.00	Seepage	1.00	Depth to water	1.00
133:							
Chedeski family-----	90	Very limited		Very limited		Very limited	
		Slope	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to bedrock	0.50				
		Seepage	0.03				

Table 21.--Engineering Properties

(Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative textu
textures follow the dash.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passin sieve number--		
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40
	In				Pct	Pct			
80:									
Remorris--------	0-4	*Loam - Very fine sandy loam	*CL -	*A-6 -	0	2-8	83-94	83-94	69-87
	4-7	*Bedrock			---	---	---	---	---
	7-60	*Bedrock			---	---	---	---	---
81:									
Moclom----------	0-3	*Gravelly loamy sand - Channery loamy sand, channery sand	*SC-SM -	*A-2-4 -	0	0-19	54-93	52-93	38-77
	3-5	*Bedrock			---	---	---	---	---
	5-11	*Bedrock			---	---	---	---	---
Simel-----------	0-1	*Channery sandy loam - Fine sandy loam	*SC -	*A-2-6 -	0-3	3-13	88-96	88-96	57-71
	1-4	*Channery sandy loam	*SC -	*A-2-6 -	0-3	0-17	84-100	84-100	63-82
	4-10	*Silty clay loam - Channery very fine sandy loam, channery silt loam	*CL -	*A-7-6 -	0	0	75-100	74-100	57-99
	10-14	*Bedrock			---	---	---	---	---
	14-24	*Bedrock			---	---	---	---	---
83:									
Arches----------	0-0	*Fine sand	*SM -	*A-2-4 -	0	0	99-100	99-100	88-95
	0-3	*Fine sand	*SM -	*A-2-4 -	0	0	94-100	93-100	85-96
	3-14	*Fine sand	*SM -	*A-2-4 -	0	0	94-100	93-100	86-97
	14-15	*Loamy fine sand - Fine sand	*SC-SM -	*A-2-4 -	0	0	93-100	93-100	81-97
	15-25	*Bedrock			---	---	---	---	---
Pensom----------	0-5	*Fine sand	*SM -	*A-2-4 -	0	0	100	100	90-95
	5-11	*Fine sand	*SP-SM -	*A-2-4 -	0	0	94-100	93-100	85-96
	11-28	*Fine sand	*SP-SM -	*A-2-4 -	0	0	94-100	93-100	85-96
	28-37	*Bedrock			---	---	---	---	---
85:									
Mident family---	0-4	*Fine sand	*SM -	*A-2-4 -	0	0	100	100	91-96
	4-9	*Fine sand	*SM -	*A-2-4 -	0	0	100	100	91-96
	9-14	*Bedrock			---	---	---	---	---
	14-24	*Bedrock			---	---	---	---	---

Table 21.--Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--		
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40
	In				Pct	Pct			
85:									
Mido------------	0-4	*Fine sand	*SM -	*A-2-4 -	0	0	100	100	91-96
	4-33	*Fine sand - Loamy fine sand	*SM -	*A-2-4 -	0	0	100	100	92-97
	33-79	*Fine sand - Sand	*SP-SM -	*A-2-4 -	0	0	88-100	87-100	80-97
86:									
Arches----------	0-2	*Loamy fine sand	*SC-SM -	*A-2-4 -	0	0	100	100	90-96
	2-10	*Loamy fine sand	*SC-SM -	*A-2-4 -	0	0	100	100	91-97
	10-20	*Bedrock			---	---	---	---	---
87:									
Arches----------	0-4	*Fine sand	*SM -	*A-2-4 -	0	0	100	100	92-96
	4-9	*Fine sand	*SM -	*A-2-4 -	0	0	100	100	92-96
	9-13	*Fine sand	*SM -	*A-2-4 -	0	0	100	100	93-97
	13-23	*Bedrock			---	---	---	---	---
88:									
Crosscan family-	0-2	*Gravelly fine sandy loam - Gravelly loamy fine sand, silt loam	*SC-SM -	*A-2-4 -	0	0	56-93	54-92	47-92
	2-4	*Very channery very fine sandy loam - Very channery fine sandy loam, channery very fine sandy loam	*GC-GM -	*A-2-4 -	0	17-30	50-80	49-79	47-79
	4-13	*Bedrock	*GM -		---	---	---	---	---
	13-23	*Bedrock			---	---	---	---	---
89:									
Reef------------	0-4	*Very channery fine sandy loam - Gravelly sandy loam, very channery sandy loam	*SC-SM -	*A-2-4 -	7-10	21-27	46-67	44-66	39-62
	4-9	*Extremely channery fine sandy loam	*GP-GC -	*A-2-4 -	10-17	24-39	21-58	18-56	17-55
	9-19	*Bedrock			---	---	---	---	---
91:									
Mido------------	0-4	*Fine sand	*SP-SM -	*A-2-4 -	0	0	100	100	93-98
	4-14	*Fine sand	*SP-SM -	*A-2-4 -	0	0	100	100	93-98
	14-55	*Fine sand - Loamy fine sand	*SP-SM -	*A-2-4 -	0	0	100	100	93-100
	55-79	*Fine sand - Loamy fine sand	*SP-SM -	*A-2-4 -	0	0	100	100	93-100

Table 21.--Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40
	In				Pct	Pct			
91:									
Mido, strongly calcareous-----	0-6	*Fine sand - Loamy fine sand	*SM -	*A-2-4 -	0	0	100	100	92-96
	6-24	*Fine sand	*SP-SM -	*A-2-4 -	0	0	100	100	92-96
	24-56	*Sand - Fine sand, loamy fine sand	*SP-SM -	*A-2-4 -	0	0	86-100	85-100	63-78
	56-60	*Fine sand - Loamy fine sand	*SP-SM -	*A-2-4 -	0	0	86-100	85-100	79-100
	60-70	*Bedrock			---	---	---	---	---
100:									
Arches----------	0-2	*Fine sand	*SM -	*A-2-4 -	0	0	94-99	93-99	84-93
	2-4	*Fine sand - Loamy fine sand	*SM -	*A-2-4 -	0	0	94-100	93-100	87-100
	4-14	*Bedrock			---	---	---	---	---
Rizno-----------	0-1	*Loamy sand	*SC-SM -	*A-2-4 -	0	0-7	93-100	92-100	73-84
	1-2	*Channery sandy loam - Sandy loam, fine sandy loam	*SC-SM -	*A-4 -	0	0-13	84-100	84-100	61-80
	2-6	*Sandy loam - Fine sandy loam, very gravelly sandy loam	*SC-SM -	*A-2 -	0	0-13	84-100	84-100	63-82
	6-16	*Bedrock			---	---	---	---	---
103:									
Mido, strongly calcareous-----	0-2	*Fine sand - Loamy fine sand	*SM -	*A-2-4 -	0	0	93-100	92-100	84-98
	2-19	*Fine sand - Loamy fine sand	*SP-SM -	*A-2-4 -	0	0	93-100	93-100	87-100
	19-35	*Fine sand - Loamy fine sand	*SM -	*A-2-4 -	0	0	93-100	93-100	87-100
	35-68	*Loamy fine sand - Fine sand	*SM -	*A-2-4 -	0	0	93-100	93-100	84-97
	68-76	*Fine sand - Loamy fine sand	*SM -	*A-2-4 -	0	0	93-100	93-100	87-100
Mido------------	0-1	*Fine sand	*SM -	*A-2-4 -	0	0	100	100	92-97
	1-15	*Fine sand - Loamy fine sand	*SM -	*A-2-4 -	0	0	100	100	91-96
	15-79	*Loamy fine sand - Fine sand	*SM -	*A-2-4 -	0	0	100	100	88-96

Table 21.--Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--		
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40
	In				Pct	Pct			
106:									
Retsabal--------	0-2	*Very fine sandy loam - Loam	*CL -	*A-4 -	0	0	100	100	96-100
	2-7	*Very fine sandy loam	*CL -	*A-4 -	0	0	100	100	95-100
	7-13	*Sandy loam - Loamy sand	*SC-SM -	*A-4 -	0	0	89-100	88-100	64-83
	13-21	*Bedrock			---	---	---	---	---
	21-26	*Bedrock			---	---	---	---	---
108:									
Milok-----------	0-4	*Loamy fine sand - Very fine sandy loam, fine sandy loam	*SM -	*A-2-4 -	0	0	93-100	92-100	86-98
	4-18	*Loamy very fine sand - Very fine sandy loam, fine sandy loam	*SC-SM -	*A-4 -	0	0	87-100	86-100	86-100
	18-37	*Loamy very fine sand - Fine sandy loam, very fine sandy loam	*SC-SM -	*A-4 -	0	0	87-100	86-100	85-100
	37-52	*Very fine sandy loam - Fine sandy loam, loamy very fine sand	*CL -	*A-4 -	0	0	87-100	86-100	78-100
	52-64	*Loamy fine sand - Fine sand	*SM -	*A-2-4 -	0	0	80-100	79-100	71-99
	64-73	*Fine sand - Very fine sand	*SM -	*A-2-4 -	0	0	80-100	79-100	73-100
Mido, strongly calcareous-----	0-5	*Loamy fine sand - Fine sand	*SM -	*A-2-4 -	0	0	94-100	93-100	83-95
	5-14	*Loamy fine sand - Fine sand	*SM -	*A-2-4 -	0	0	94-100	93-100	80-95
	14-44	*Loamy fine sand - Fine sand	*SM -	*A-2-4 -	0	0	94-100	93-100	80-95
	44-49	*Loamy fine sand - Fine sand	*SM -	*A-2-4 -	0	0	94-100	93-100	80-95
	49-73	*Fine sand	*SM -	*A-2-4 -	0	0	100	100	92-97
	73-81	*Fine sand	*SM -	*A-2-4 -	0	0	100	100	92-97

Table 21.--Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passin sieve number--		
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40
	In				Pct	Pct			
110:									
Bowington-------	0-1	*Very fine sand - Fine sand	*SM -	*A-4 -	0	0	100	100	99-100
	1-10	*Fine sand - Fine sand, very fine sand	*SP-SM -	*A-3 -	0	0	93-100	93-100	87-98
	10-25	*Fine sand - Fine sand, very fine sand	*SP-SM -	*A-3 -	0	0	93-100	93-100	87-98
	25-33	*Very fine sand - Fine sand	*SM -	*A-4 -	0	0	93-100	93-100	91-100
	33-38	*Fine sand - Fine sand, very fine sand	*SP-SM -	*A-2-4 -	0	0	93-100	93-100	87-97
	38-43	*Coarse sand - Sand, fine sand	*SW-SM -	*A-1-b -	0	0	61-100	59-100	27-50
	43-48	*Sand - Fine sand, coarse sand	*SP-SM -	*A-3 -	0	0	59-100	57-100	44-80
	48-52	*Coarse sand - Fine sand, sand	*SW-SM -	*A-1-b -	0	0	61-100	59-100	27-50
	52-79	*Coarse sand - Fine sand, sand	*SW-SM -	*A-1-b -	0	0	61-100	59-100	27-50
Radnik----------	0-5	*Fine sand - Loamy fine sand, fine sandy loam	*SM -	*A-2-4 -	0	0	100	100	94-100
	5-13	*Fine sand - Loamy fine sand	*SM -	*A-2-4 -	0	0	100	100	94-100
	13-23	*Loamy fine sand - Fine sand	*SC-SM -	*A-2-4 -	0	0	100	100	86-96
	23-37	*Sand - Fine sand	*SP-SM -	*A-3 -	0	0	94-100	93-100	71-80
	37-43	*Sand - Fine sand	*SM -	*A-2-4 -	0	0	94-100	93-100	70-79
	43-57	*Sand - Fine sand	*SM -	*A-2-4 -	0	0	94-100	93-100	70-79
	57-83	*Sand - Fine sand	*SP-SM -	*A-3 -	0	0	94-100	93-100	71-80
Patterfield-----	0-6	*Sandy loam - Silt loam, loam	*SC -	*A-6 -	0	0-3	96-100	96-100	68-77
	6-29	*Sandy clay loam - Fine sandy loam, silt loam	*CL -	*A-6 -	0	0	92-100	92-100	73-94
	29-40	*Fine sandy loam - Silt loam, sandy clay loam	*SC-SM -	*A-4 -	0	0	93-100	93-100	85-100
	40-65	*Sandy clay loam - Silt loam, fine sandy loam	*CL -	*A-6 -	0	0	92-100	92-100	69-90
	65-79	*Sandy clay loam	*CL -	*A-6 -	0	0-3	96-100	96-100	74-92

Table 21.--Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--		
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40
	In				Pct	Pct			
111:									
Hanksville------	0-3	*Silty clay loam - Clay loam	*CL -	*A-7-6 -	0	0	100	100	92-100
	3-19	*Very parachannery silty clay loam - Parachannery silty clay loam, silty clay loam	*CL -	*A-7-6 -	0	0	100	100	86-99
	19-60	*Bedrock			---	---	---	---	---
Persayo---------	0-2	*Clay loam - Silt loam, silty clay loam	*CL -	*A-7-6 -	0	0-7	83-100	82-100	71-96
	2-8	*Parachannery clay loam - Silty clay loam	*CL -	*A-7-6 -	0	5-9	78-89	77-89	67-84
	8-18	*Bedrock			---	---	---	---	---
116:									
Begay, overwash-	0-4	*Fine sand - Loamy fine sand, fine sandy loam	*SM -	*A-2-4 -	0	0	92-100	91-100	85-100
	4-11	*Loamy fine sand - Fine sandy loam, very fine sandy loam	*SM -	*A-2-4 -	0	0	93-100	92-100	87-100
	11-24	*Fine sandy loam - Very fine sandy loam	*CL-ML -	*A-4 -	0	0	92-100	92-100	71-90
	24-49	*Fine sandy loam - Very fine sandy loam	*CL-ML -	*A-4 -	0	0	93-100	92-100	73-92
	49-72	*Fine sandy loam - Very fine sandy loam	*SC-SM -	*A-4 -	0	0	93-100	93-100	80-96
117:									
Arches----------	0-1	*Fine sand	*SM -	*A-2-4 -	0	0-3	96-100	96-100	88-96
	1-4	*Fine sand - Loamy fine sand	*SM -	*A-2-4 -	0	0-3	96-100	96-100	89-99
	4-6	*Bedrock			---	---	---	---	---
	6-16	*Bedrock			---	---	---	---	---

Table 21.--Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40
	In				Pct	Pct			
118:									
Monue-----------	0-2	*Gravelly loamy fine sand - Sandy loam, gravelly fine sandy loam	*SM -	*A-2-4 -	0	0	68-93	66-93	62-93
	2-6	*Fine sandy loam	*SC -	*A-2-6 -	0	0	86-93	85-93	74-87
	6-19	*Fine sandy loam - Sandy loam, gravelly sandy clay loam	*SC -	*A-2-4 -	0	0-17	68-93	67-93	59-91
	19-33	*Fine sandy loam - Gravelly sandy loam	*SC-SM -	*A-2-4 -	0	0	74-93	72-93	65-90
	33-36	*Gravelly sandy loam - Fine sandy loam	*SC -	*A-2-4 -	0	0	74-93	72-93	51-73
	36-79	*Boulders			---	---	---	---	---
119:									
Persayo---------	0-2	*Silt loam - Loam	*CL -	*A-4 -	0	0-8	78-100	77-100	68-96
	2-10	*Silty clay loam - Clay loam, loam	*CL -	*A-7-6 -	0	0-10	74-100	73-100	64-100
	10-16	*Clay loam	*CL -	*A-7-6 -	0	0-5	82-100	81-100	68-100
	16-26	*Bedrock			---	---	---	---	---
Somorent family-	0-5	*Gravelly fine sandy loam - Very gravelly sandy loam, loamy coarse sand	*SC -	*A-2-6 -	0	0	58-87	56-86	48-80
	5-9	*Fine sandy loam - Gravelly loam, gravelly coarse sandy loam	*SC -	*A-6 -	0	0	58-93	56-93	46-90
	9-19	*Bedrock			---	---	---	---	---
	19-29	*Bedrock			---	---	---	---	---
126:									
Rizno-----------	0-2	*Very fine sand - Fine sand, loamy fine sand	*SM -	*A-4 -	0	0	86-100	85-100	83-100
	2-7	*Very fine sand - Loamy very fine sand, gravelly very fine sandy loam, fine sandy loam	*SM -	*A-4 -	0	0	57-93	55-93	54-93
	7-13	*Fine sandy loam - Gravelly very fine sandy loam, loamy very fine sand, very fine sand	*SC-SM -	*A-2-4 -	0	0	56-93	54-92	46-91
	13-15	*Bedrock			---	---	---	---	---
	15-25	*Bedrock			---	---	---	---	---

Table 21.--Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--		
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40
	In				Pct	Pct			
126:									
Arches----------	0-2	*Fine sand	*SP-SM -	*A-3 -	0	0	100	100	94-98
	2-11	*Fine sand	*SP-SM -	*A-3 -	0	0	93-100	93-100	87-98
	11-21	*Bedrock			---	---	---	---	---
Mido------------	0-7	*Fine sand	*SP-SM -	*A-2-4 -	0	0	100	100	93-97
	7-23	*Fine sand	*SP-SM -	*A-2-4 -	0	0	100	100	94-98
	23-46	*Fine sand	*SP-SM -	*A-3 -	0	0	100	100	94-98
	46-73	*Fine sand	*SP-SM -	*A-3 -	0	0	100	100	94-98
127:									
Pocum family----	0-4	*Loamy fine sand - Gravelly loamy fine sand, very fine sandy loam	*SC-SM -	*A-2-4 -	0	0	65-93	63-92	58-92
	4-18	*Gravelly fine sandy loam - Sandy loam, very gravelly fine sandy loam	*SC -	*A-2-4 -	0	0	61-93	59-92	51-88
	18-23	*Cemented material			---	---	---	---	---
	23-33	*Bedrock			---	---	---	---	---
129:									
Milok-----------	0-1	*Very gravelly sandy loam - Gravelly fine sandy loam, very gravelly fine sandy loam	*GP-GC -	*A-2-4 -	0	0	38-77	35-76	26-62
	1-7	*Very gravelly sandy loam - Gravelly very fine sandy loam, gravelly loamy sand	*GC -	*A-2-4 -	0	0-9	45-91	42-91	29-73
	7-19	*Gravelly sandy loam - Gravelly loamy sand, gravelly very fine sandy loam, very gravelly sandy loam	*SC-SM -	*A-2-4 -	0	0-9	45-91	42-91	29-73
	19-51	*Gravelly loamy sand - Gravelly very fine sandy loam, very gravelly sandy loam	*SM -	*A-1-b -	0	0	48-92	45-91	35-82
	51-79	*Sand - Gravelly loamy sand	*SP-SM -	*A-2-4 -	0	0	58-84	56-83	44-71

Table 21.--Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passin sieve number--: 4	Percentage passin sieve number--: 10	Percentage passin sieve number--: 40
	In				Pct	Pct			
132:									
Livan family----	0-6	*Fine sand - Very gravelly coarse sand, loamy very fine sand	*SM -	*A-2-4 -	0	0	19-100	15-100	14-100
	6-27	*Sand - Very fine sand, gravelly loamy sand, fine sand, extremely gravelly sand	*SP-SM -	*A-3 -	0	0	19-100	15-100	11-85
	27-28	*Very gravelly coarse sand - Very gravelly sand	*GW -	*A-1-a -	0	0	19-100	16-100	7-52
	28-35	*Extremely gravelly coarse sand - Very gravelly coarse sand, very gravelly sand	*GW -	*A-1-a -	0	0	19-100	16-100	7-51
	35-49	*Extremely gravelly coarse sand - Very gravelly coarse sand, extremely gravelly coarse sand, sand	*GW -	*A-1-a -	0	0-19	22-100	19-100	8-51
	49-79	*Extremely gravelly loamy coarse sand - Gravelly sand, extremely gravelly sand	*GP-GM -	*A-1-a -	0-7	0-7	20-100	17-100	8-59
133:									
Chedeski family-	0-4	*Gravelly sandy clay loam - Gravelly fine sandy loam, channery sandy loam	*GC -	*A-2-6 -	0	0-19	44-100	42-100	31-90
	4-10	*Very gravelly sandy clay loam - Gravelly sandy clay loam, gravelly fine sandy loam	*GC -	*A-2-7 -	0	0-7	51-67	49-66	34-57
	10-19	*Gravelly sandy clay loam - Very gravelly sandy clay loam, gravelly fine sandy loam	*SC -	*A-2-6 -	0-28	0-3	70-85	68-84	51-77
	19-29	*Bedrock			---	---	---	---	---

Table 22.--Physical Soil Properties

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind
apply only to the surface layer. Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion f	
										Kw	Kf
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct		
80:											
Remorris------------	0-4	30-49	35-55	18-27	1.30-1.50	0.6-2	0.13-0.19	0.0-2.9	0.5-1.5	.37	.3
	4-7	---	---	---	---	0.2-0.6	---	---	---	---	--
	7-60	---	---	---	---	0.2-0.6	---	---	---	---	--
81:											
Moclom--------------	0-3	78-95	3-13	1-10	1.55-1.65	6-20	0.05-0.11	0.0-2.9	0.5-1.0	.15	.2
	3-5	---	---	---	---	0.2-0.6	---	---	---	---	--
	5-11	---	---	---	---	0.00-0.2	---	---	---	---	--
Simel---------------	0-1	60-82	5-25	10-18	1.50-1.60	2-6	0.10-0.14	0.0-2.9	1.0-2.0	.15	.2
	1-4	60-80	7-25	18-25	1.45-1.55	2-6	0.12-0.19	0.0-2.9	0.8-1.5	.15	.2
	4-10	14-75	40-55	18-40	1.55-1.65	0.2-2	0.14-0.20	3.0-5.9	0.2-0.8	.37	.3
	10-14	---	---	---	---	0.2-0.6	---	---	---	---	--
	14-24	---	---	---	---	0.00-0.2	---	---	---	---	--
83:											
Arches--------------	0-0	87-98	1-9	0-5	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.8-1.5	.20	.2
	0-3	87-98	1-9	0-5	1.60-1.80	6-20	0.05-0.08	0.0-2.9	0.5-1.0	.24	.2
	3-14	87-98	1-9	0-5	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.2-0.8	.24	.2
	14-15	78-98	4-16	0-7	1.50-1.80	6-20	0.05-0.11	0.0-2.9	0.1-0.5	.32	.3
	15-25	---	---	---	---	0.00-0.2	---	---	---	---	--
Pensom--------------	0-5	87-98	0-9	0-5	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.8-1.5	.10	.1
	5-11	87-98	0-9	0-5	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.5-1.0	.10	.1
	11-28	87-98	1-9	0-5	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.2-0.8	.20	.2
	28-37	---	---	---	---	0.00-0.2	---	---	---	---	--
85:											
Mident family-------	0-4	87-98	1-9	0-5	1.55-1.75	6-100	0.06-0.09	0.0-2.9	0.5-1.0	.20	.2
	4-9	87-98	1-9	0-5	1.55-1.75	6-100	0.06-0.09	0.0-2.9	0.2-0.8	.24	.2
	9-14	---	---	---	---	0.2-0.6	---	---	---	---	--
	14-24	---	---	---	---	0.00-0.2	---	---	---	---	--
Mido----------------	0-4	87-98	1-9	0-5	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.2-1.0	.10	.1
	4-33	80-98	1-12	0-5	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.2-0.8	.15	.1
	33-79	87-98	1-9	0-5	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.1-0.5	.10	.1
86:											
Arches--------------	0-2	78-90	4-16	4-10	1.55-1.65	6-20	0.07-0.10	0.0-2.9	1.0-2.0	.28	.2
	2-10	78-90	4-16	4-10	1.55-1.65	6-20	0.07-0.10	0.0-2.9	0.8-1.5	.32	.3
	10-20	---	---	---	---	0.00-0.2	---	---	---	---	--

Table 22.--Physical Soil Properties--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permea-bility (Ksat)	Available water capacity	Linear extensi-bility	Organic matter	Erosion f	
										Kw	Kf
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct		
87:											
Arches--------------	0-4	87-98	1-9	1-5	1.55-1.70	6-100	0.06-0.08	0.0-2.9	0.5-1.0	.24	.2
	4-9	87-98	1-9	1-5	1.55-1.70	6-100	0.06-0.08	0.0-2.9	0.2-0.8	.20	.2
	9-13	87-98	1-9	1-5	1.55-1.70	6-100	0.06-0.08	0.0-2.9	0.2-0.8	.24	.2
	13-23	---	---	---	---	0.00-0.2	---	---	---	---	--
88:											
Crosscan family-----	0-2	20-90	5-50	5-18	1.40-1.50	2-20	0.09-0.13	0.0-2.9	0.5-1.0	.15	.2
	2-4	53-82	6-33	10-18	1.40-1.50	2-6	0.08-0.13	0.0-2.9	0.2-0.8	.17	.5
	4-13	---	---	---	---	0.2-0.6	---	---	---	---	--
	13-23	---	---	---	---	0.00-0.2	---	---	---	---	--
89:											
Reef----------------	0-4	60-82	7-25	10-15	1.60-1.75	2-6	0.07-0.12	0.0-2.9	0.8-1.5	.10	.3
	4-9	60-82	6-33	10-18	1.60-1.75	2-6	0.05-0.12	0.0-2.9	0.0-0.8	.05	.3
	9-19	---	---	---	---	0.00-0.2	---	---	---	---	--
91:											
Mido----------------	0-4	87-98	1-9	0-5	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.2-0.8	.10	.1
	4-14	87-98	1-9	0-5	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.1-0.5	.15	.1
	14-55	85-98	1-12	0-10	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.1-0.5	.15	.1
	55-79	85-98	1-12	0-10	1.60-1.80	6-100	0.05-0.08	0.0-2.9	0.1-0.5	.15	.1
Mido, strongly calcareous---------	0-6	85-98	1-12	1-5	1.40-1.60	6-100	0.05-0.11	0.0-2.9	0.8-1.2	.10	.1
	6-24	87-98	1-9	1-5	1.45-1.60	6-100	0.05-0.11	0.0-2.9	0.2-0.8	.10	.1
	24-56	85-98	1-12	1-5	1.45-1.60	6-20	0.05-0.11	0.0-2.9	0.1-0.5	.05	.0
	56-60	85-98	1-12	1-10	1.45-1.60	6-100	0.05-0.11	0.0-2.9	0.1-0.5	.24	.2
	60-70	---	---	---	---	0.00-0.2	---	---	---	---	--
100:											
Arches--------------	0-2	87-98	1-9	1-5	1.60-1.70	6-100	0.05-0.08	0.0-2.9	1.0-1.5	.24	.2
	2-4	85-98	1-10	1-10	1.50-1.70	6-100	0.05-0.11	0.0-2.9	0.2-0.8	.24	.2
	4-14	---	---	---	---	0.00-0.2	---	---	---	---	--
Rizno---------------	0-1	78-88	4-16	5-10	1.50-1.60	6-20	0.05-0.09	0.0-2.9	0.5-1.0	.17	.1
	1-2	60-80	7-25	8-15	1.45-1.60	2-6	0.10-0.14	0.0-2.9	0.2-0.8	.17	.2
	2-6	60-80	10-25	8-15	1.45-1.60	2-6	0.10-0.14	0.0-2.9	0.1-0.5	.37	.3
	6-16	---	---	---	---	0.00-0.2	---	---	---	---	--

Table 22.--Physical Soil Properties--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion f Kw	Kf
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct		
103:											
Mido, strongly calcareous---------	0-2	80-98	1-12	1-8	1.40-1.60	6-100	0.05-0.10	0.0-2.9	0.8-1.2	.10	.1
	2-19	85-98	1-12	1-8	1.50-1.60	6-100	0.05-0.10	0.0-2.9	0.2-0.8	.10	.1
	19-35	85-98	1-12	1-8	1.50-1.60	6-100	0.05-0.10	0.0-2.9	0.1-0.5	.15	.1
	35-68	78-98	4-16	1-8	1.50-1.60	6-20	0.05-0.10	0.0-2.9	0.1-0.5	.28	.2
	68-76	85-98	1-12	1-8	1.50-1.60	6-100	0.05-0.10	0.0-2.9	0.1-0.5	.15	.1
Mido----------------	0-1	87-98	1-12	0-5	1.60-1.80	6-100	0.05-0.07	0.0-2.9	0.5-1.0	.15	.1
	1-15	85-98	1-12	0-5	1.60-1.80	6-100	0.05-0.10	0.0-2.9	0.2-0.8	.15	.1
	15-79	78-98	1-16	0-8	1.60-1.80	6-20	0.05-0.10	0.0-2.9	0.0-0.5	.24	.2
106:											
Retsabal------------	0-2	50-80	15-40	10-18	1.30-1.50	0.6-6	0.13-0.17	0.0-2.9	0.5-1.0	.55	.5
	2-7	53-80	6-33	10-15	1.30-1.50	2-6	0.13-0.17	0.0-2.9	0.0-0.5	.55	.5
	7-13	59-80	7-25	5-15	0.90-1.10	2-20	0.06-0.13	0.0-2.9	0.0-0.5	.32	.3
	13-21	---	---	---	---	0.2-0.6	---	---	---	---	--
	21-26	---	---	---	---	0.2-0.6	---	---	---	---	--
108:											
Milok---------------	0-4	60-88	4-25	5-10	1.40-1.60	6-20	0.08-0.12	0.0-2.9	0.8-1.2	.24	.2
	4-18	60-88	4-16	7-18	1.50-1.60	2-20	0.08-0.12	0.0-2.9	0.2-0.8	.49	.4
	18-37	60-88	4-16	7-18	1.50-1.60	2-20	0.08-0.12	0.0-2.9	0.1-0.5	.49	.4
	37-52	53-82	6-33	7-18	1.50-1.60	2-20	0.09-0.16	0.0-2.9	0.1-0.5	.43	.4
	52-64	78-98	1-16	1-10	1.50-1.60	6-20	0.05-0.09	0.0-2.9	0.1-0.5	.28	.2
	64-73	87-98	1-9	1-10	1.50-1.60	6-100	0.05-0.08	0.0-2.9	0.1-0.5	.15	.1
Mido, strongly calcareous---------	0-5	78-98	1-12	1-8	1.60-1.80	6-20	0.05-0.11	0.0-2.9	0.5-1.0	.24	.2
	5-14	78-98	1-16	1-10	1.60-1.80	6-20	0.05-0.11	0.0-2.9	0.2-0.8	.24	.2
	14-44	78-98	1-16	1-10	1.60-1.80	6-20	0.05-0.11	0.0-2.9	0.2-0.8	.24	.2
	44-49	78-98	1-16	1-10	1.60-1.80	6-20	0.05-0.11	0.0-2.9	0.2-0.8	.24	.2
	49-73	88-98	1-9	0-6	1.60-1.80	6-100	0.05-0.07	0.0-2.9	0.2-0.8	.15	.1
	73-81	88-98	1-8	0-6	1.60-1.80	6-100	0.05-0.07	0.0-2.9	0.2-0.8	.15	.1
110:											
Bowington-----------	0-1	87-99	0-6	1-5	1.50-1.70	6-100	0.05-0.08	0.0-2.9	1.0-3.0	.49	.4
	1-10	87-99	0-6	1-5	1.50-1.70	6-100	0.05-0.08	0.0-2.9	0.8-2.0	.10	.1
	10-25	87-99	0-6	1-5	1.50-1.70	6-100	0.04-0.08	0.0-2.9	0.8-2.0	.10	.1
	25-33	87-98	1-6	1-5	1.50-1.70	6-100	0.04-0.08	0.0-2.9	0.5-1.0	.55	.5
	33-38	87-99	0-6	1-5	1.50-1.70	6-100	0.04-0.08	0.0-2.9	0.5-1.0	.10	.1
	38-43	87-98	1-9	1-5	1.60-1.80	20-100	0.04-0.08	0.0-2.9	0.5-1.0	.10	.1
	43-48	87-99	0-6	1-5	1.60-1.80	6-100	0.04-0.08	0.0-2.9	0.5-1.0	.05	.0
	48-52	87-98	1-9	1-5	1.60-1.80	0.2-100	0.04-0.08	0.0-2.9	0.5-1.0	.10	.1
	52-79	87-98	1-9	1-5	1.60-1.80	6-100	0.04-0.08	0.0-2.9	0.5-1.0	.10	.1

Table 22.--Physical Soil Properties--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion f	
										Kw	Kf
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct		
110:											
Radnik--------------	0-5	75-98	1-15	4-12	1.50-1.70	2-100	0.05-0.12	0.0-2.9	1.0-3.0	.10	.1
	5-13	83-98	1-12	2-12	1.55-1.70	6-100	0.06-0.11	0.0-2.9	0.8-1.5	.10	.1
	13-23	80-98	1-10	2-12	1.55-1.70	6-20	0.06-0.11	0.0-2.9	0.5-1.0	.20	.2
	23-37	87-98	1-6	1-5	1.60-1.70	6-100	0.04-0.08	0.0-2.9	0.2-0.8	.10	.1
	37-43	87-98	1-8	1-5	1.60-1.70	6-100	0.04-0.08	0.0-2.9	0.2-0.8	.10	.1
	43-57	87-98	1-8	1-5	1.60-1.70	6-100	0.04-0.08	0.0-2.9	0.2-0.8	.10	.1
	57-83	87-98	1-8	1-5	1.60-1.70	6-100	0.04-0.08	0.0-2.9	0.2-0.8	.05	.0
110:											
Patterfield---------	0-6	35-80	10-50	12-18	1.40-1.60	0.2-6	0.10-0.20	0.0-2.9	1.0-3.0	.24	.2
	6-29	35-75	18-50	12-27	1.40-1.60	0.2-6	0.10-0.18	0.0-2.9	0.8-1.5	.32	.3
	29-40	35-82	10-50	12-27	1.40-1.60	0.2-6	0.10-0.18	0.0-2.9	0.5-1.0	.28	.2
	40-65	35-75	18-50	12-27	1.40-1.60	0.2-6	0.10-0.18	0.0-2.9	0.2-0.8	.28	.2
	65-79	50-75	18-26	12-27	1.45-1.60	0.2-6	0.13-0.19	0.0-2.9	0.2-0.8	.28	.2
111:											
Hanksville----------	0-3	14-25	40-55	27-40	1.40-1.55	0.02-0.6	0.14-0.20	3.0-5.9	0.5-1.0	.43	.4
	3-19	10-20	42-55	27-40	1.45-1.60	0.02-0.2	0.11-0.19	3.0-5.9	0.2-0.8	.37	.3
	19-60	---	---	---	---	0.2-0.6	---	---	---	---	--
Persayo-------------	0-2	20-45	25-52	25-35	1.40-1.55	0.2-0.6	0.14-0.20	3.0-5.9	0.5-1.0	.32	.3
	2-8	18-45	25-52	27-35	1.45-1.60	0.2-0.6	0.14-0.20	3.0-5.9	0.2-0.8	.32	.3
	8-18	---	---	---	---	0.2-0.6	---	---	---	---	--
116:											
Begay, overwash-----	0-4	80-98	1-15	3-10	1.20-1.40	2-100	0.05-0.14	0.0-2.9	1.0-3.0	.10	.1
	4-11	75-88	4-20	5-18	1.30-1.55	2-20	0.08-0.15	0.0-2.9	0.8-1.2	.32	.3
	11-24	53-82	5-30	5-18	1.30-1.55	2-6	0.10-0.18	0.0-2.9	0.5-1.0	.28	.2
	24-49	53-82	5-30	5-18	1.30-1.55	2-6	0.10-0.18	0.0-2.9	0.2-0.8	.32	.3
	49-72	53-82	5-30	5-15	1.40-1.55	2-20	0.08-0.18	0.0-2.9	0.2-0.8	.28	.2
117:											
Arches--------------	0-1	87-98	1-9	1-5	1.50-1.70	6-100	0.05-0.08	0.0-2.9	0.8-2.0	.24	.2
	1-4	78-98	1-12	2-8	1.45-1.70	6-100	0.05-0.10	0.0-2.9	0.2-1.0	.24	.2
	4-6	---	---	---	---	0.2-0.6	---	---	---	---	--
	6-16	---	---	---	---	0.00-0.2	---	---	---	---	--
118:											
Monue---------------	0-2	75-87	4-20	5-18	1.45-1.60	6-20	0.06-0.11	0.0-2.9	0.8-1.2	.17	.2
	2-6	60-82	5-30	10-18	1.45-1.60	2-6	0.10-0.14	0.0-2.9	0.5-1.0	.20	.2
	6-19	60-82	5-30	10-20	1.50-1.65	2-6	0.10-0.14	0.0-2.9	0.2-0.8	.24	.2
	19-33	60-82	5-30	10-18	1.45-1.60	2-6	0.10-0.14	0.0-2.9	0.1-0.5	.28	.2
	33-36	60-82	5-30	10-18	1.45-1.60	2-6	0.09-0.18	0.0-2.9	0.1-0.5	.15	.2
	36-79	---	---	---	---	6-20	---	---	---	---	--

Table 22.--Physical Soil Properties--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion f	
										Kw	Kf
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct		
119:											
Persayo-------------	0-2	15-40	45-72	10-18	1.40-1.50	0.2-2	0.14-0.20	3.0-5.9	0.5-1.0	.43	.4
	2-10	14-35	45-65	18-35	1.45-1.55	0.2-2	0.14-0.20	3.0-5.9	0.2-0.8	.43	.4
	10-16	21-45	25-50	28-35	1.45-1.55	0.2-2	0.14-0.20	3.0-5.9	0.0-0.5	.37	.3
	16-26	---	---	---	---	0.00-0.6	---	---	---	---	--
Somorent family-----	0-5	60-82	5-30	10-18	1.50-1.65	2-20	0.06-0.14	0.0-2.9	0.5-1.0	.10	.2
	5-9	48-82	5-35	10-25	1.50-1.60	0.6-6	0.10-0.18	0.0-2.9	0.2-0.8	.32	.3
	9-19	---	---	---	---	0.2-0.6	---	---	---	---	--
	19-29	---	---	---	---	0.00-0.2	---	---	---	---	--
126:											
Rizno---------------	0-2	78-98	1-10	2-10	1.45-1.60	6-100	0.05-0.11	0.0-2.9	0.8-1.2	.64	.6
	2-7	80-98	1-15	5-18	1.40-1.60	6-100	0.05-0.18	0.0-2.9	0.5-1.0	.64	.6
	7-13	60-90	5-30	5-18	1.40-1.55	0.6-20	0.05-0.18	0.0-2.9	0.1-0.5	.37	.3
	13-15	---	---	---	---	0.2-0.6	---	---	---	---	--
	15-25	---	---	---	---	0.00-0.2	---	---	---	---	--
Arches--------------	0-2	87-99	0-8	1-5	1.50-1.70	6-100	0.05-0.08	0.0-2.9	0.8-1.5	.20	.2
	2-11	87-99	0-8	1-5	1.50-1.70	6-100	0.05-0.08	0.0-2.9	0.2-1.0	.20	.2
	11-21	---	---	---	---	0.00-0.2	---	---	---	---	--
Mido----------------	0-7	87-98	1-9	1-5	1.50-1.65	6-100	0.05-0.08	0.0-2.9	0.8-1.2	.10	.1
	7-23	87-98	1-9	1-5	1.50-1.65	6-100	0.05-0.08	0.0-2.9	0.2-0.8	.10	.1
	23-46	87-99	0-8	1-5	1.55-1.70	6-100	0.05-0.08	0.0-2.9	0.1-0.5	.10	.1
	46-73	87-99	0-8	1-5	1.55-1.70	6-100	0.05-0.08	0.0-2.9	0.1-0.5	.10	.1
127:											
Pocum family--------	0-4	78-88	4-16	5-15	1.40-1.65	2-20	0.08-0.16	0.0-2.9	0.8-1.2	.37	.3
	4-18	60-82	5-30	10-18	1.40-1.60	2-6	0.10-0.18	0.0-2.9	0.2-0.8	.15	.3
	18-23	---	---	---	1.75-1.85	0.00- 0.00	---	---	---	---	--
	23-33	---	---	---	---	0.00-0.2	---	---	---	---	--
129:											
Milok---------------	0-1	60-82	5-25	10-18	1.35-1.50	2-6	0.06-0.11	0.0-2.9	0.8-1.5	.05	.2
	1-7	60-85	5-25	6-18	1.25-1.55	2-6	0.06-0.15	0.0-2.9	0.5-1.0	.10	.2
	7-19	60-85	5-25	6-18	1.35-1.50	2-6	0.06-0.15	0.0-2.9	0.5-1.0	.10	.2
	19-51	75-88	5-20	6-18	1.35-1.55	2-20	0.05-0.15	0.0-2.9	0.2-0.8	.10	.2
	51-79	78-98	1-12	3-10	1.35-1.60	6-100	0.05-0.15	0.0-2.9	0.2-0.8	.10	.1

Table 22.--Physical Soil Properties--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion f[actors] Kw	Kf
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct		
132:											
Livan family--------	0-6	85-98	1-12	1-10	1.50-1.80	6-100	0.04-0.09	0.0-2.9	0.8-2.0	.10	.1
	6-27	85-98	1-12	1-10	1.50-1.80	6-100	0.04-0.09	0.0-2.9	0.5-1.0	.05	.0
	27-28	89-98	1-8	1-10	1.50-1.80	6-100	0.03-0.09	0.0-2.9	0.2-1.0	.02	.0
	28-35	89-99	0-8	1-10	1.50-1.80	6-100	0.02-0.09	0.0-2.9	0.2-1.0	.02	.0
	35-49	89-99	0-8	1-10	1.50-1.80	6-100	0.02-0.09	0.0-2.9	0.2-1.0	.02	.0
	49-79	78-98	1-12	1-10	1.50-1.80	6-100	0.02-0.09	0.0-2.9	0.2-1.0	.02	.1
133:											
Chedeski family-----	0-4	50-82	5-25	10-27	1.50-1.60	0.2-2	0.10-0.18	3.0-5.9	0.8-1.2	.10	.1
	4-10	50-75	10-24	18-35	1.40-1.60	0.2-2	0.08-0.18	3.0-5.9	0.2-0.8	.10	.2
	10-19	50-75	5-24	18-35	1.40-1.60	0.2-2	0.10-0.20	3.0-5.9	0.1-0.5	.10	.1
	19-29	---	---	---	---	0.2-0.6	---	---	---	---	--

Table 23.--Erosion Properties of Soils

Entries under "Erosion factors" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

Map symbol and soil name	Depth Inches	Erosion factors Kw	Kf	T	Wind erodi-bility group	Wind erodi-bility index
87:						
Arches	0-4	.24	.24	1	1	220
	4-9	.20	.20			
	9-13	.24	.24			
	13-23	---	---			
88:						
Crosscan Family	0-2	.15	.24	1	5	56
	2-4	.17	.55			
	4-13	---	---			
	13-23	---	---			
89:						
Reef	0-4	.10	.32	1	6	48
	4-9	.05	.32			
	9-19	---	---			
91:						
Mido	0-4	.10	.10	5	1	220
	4-14	.15	.15			
	14-55	.15	.15			
	55-79	.15	.15			
Mido, strongly calcareous	0-6	.10	.10	5	1	220
	6-24	.10	.10			
	24-56	.05	.05			
	56-60	.24	.24			
	60-70	---	---			
100:						
Arches	0-2	.24	.24	1	1	220
	2-4	.24	.24			
	4-14	---	---			
Rizno	0-1	.17	.17	1	2	134
	1-2	.17	.28			
	2-6	.37	.37			
	6-16	---	---			
103:						
Mido, strongly calcareous	0-2	.10	.10	5	1	220
	2-19	.10	.10			
	19-35	.15	.15			
	35-68	.28	.28			
	68-76	.15	.15			
Mido	0-1	.15	.15	5	1	220
	1-15	.15	.15			
	15-79	.24	.24			
106:						
Retsabal	0-2	.55	.55	1	3	86
	2-7	.55	.55			
	7-13	.32	.32			
	13-21	---	---			
	21-26	---	---			

Table 23.--Erosion Properties of Soils--Continued

(Entries under "Erosion factors" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

Map symbol and soil name	Depth Inches	Erosion factors			Wind erodi-bility group	Wind erodi-bility index
		Kw	Kf	T		
108:						
Milok	0-4	.24	.24	5	2	134
	4-18	.49	.49			
	18-37	.49	.49			
	37-52	.43	.43			
	52-64	.28	.28			
	64-73	.15	.15			
Mido, strongly calcareous	0-5	.24	.24	5	2	134
	5-14	.24	.24			
	14-44	.24	.24			
	44-49	.24	.24			
	49-73	.15	.15			
	73-81	.15	.15			
110:						
Bowington	0-1	.49	.49	5	1	220
	1-10	.10	.10			
	10-25	.10	.10			
	25-33	.55	.55			
	33-38	.10	.10			
	38-43	.10	.10			
	43-48	.05	.05			
	48-52	.10	.10			
	52-79	.10	.10			
Radnik	0-5	.10	.10	5	1	220
	5-13	.10	.10			
	13-23	.20	.20			
	23-37	.10	.10			
	37-43	.10	.10			
	43-57	.10	.10			
	57-83	.05	.05			
Patterfield	0-6	.24	.24	5	3	86
	6-29	.32	.32			
	29-40	.28	.28			
	40-65	.28	.28			
	65-79	.28	.28			
111:						
Hanksville	0-3	.43	.43	2	4L	86
	3-19	.37	.37			
	19-60	---	---			
Persayo	0-2	.32	.32	1	4L	86
	2-8	.32	.32			
	8-18	---	---			
116:						
Begay, overwash	0-4	.10	.10	5	1	220
	4-11	.32	.32			
	11-24	.28	.28			
	24-49	.32	.32			
	49-72	.28	.28			

Table 23.--Erosion Properties of Soils—Continued

(Entries under "Erosion factors" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

Map symbol and soil name	Depth Inches	Erosion factors Kw	Kf	T	Wind erodi-bility group	Wind erodi-bility index
117:						
Arches	0-1	.24	.24	1	1	250
	1-4	.24	.24			
	4-6	---	---			
	6-16	---	---			
118:						
Monue	0-2	.17	.28	2	2	134
	2-6	.20	.20			
	6-19	.24	.24			
	19-33	.28	.28			
	33-36	.15	.20			
	36-79	---	---			
119:						
Persayo	0-2	.43	.43	1	4L	86
	2-10	.43	.43			
	10-16	.37	.37			
	16-26	---	---			
Somorent Family	0-5	.10	.24	1	5	56
	5-9	.32	.32			
	9-19	---	---			
	19-29	---	---			
126:						
Rizno	0-2	.64	.64	1	1	220
	2-7	.64	.64			
	7-13	.37	.37			
	13-15	---	---			
	15-25	---	---			
Arches	0-2	.20	.20	1	1	220
	2-11	.20	.20			
	11-21	---	---			
127:						
Pocum Family	0-4	.37	.37	1	2	134
	4-18	.15	.32			
	18-23	---	---			
	23-33	---	---			
129:						
Milok	0-1	.05	.20	5	6	48
	1-7	.10	.20			
	7-19	.10	.20			
	19-51	.10	.20			
	51-79	.10	.10			

Table 23.--Erosion Properties of Soils—Continued

(Entries under "Erosion factors" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

Map symbol and soil name	Depth Inches	Erosion factors Kw	Kf	T	Wind erodi-bility group	Wind erodi-bility index
132:						
Livan Family---------------------------	0-6	.10	.10	3	1	220
	6-27	.05	.05			
	27-28	.02	.05			
	28-35	.02	.05			
	35-49	.02	.05			
	49-79	.02	.15			
133:						
Chedeski Family------------------------	0-4	.10	.17	2	5	56
	4-10	.10	.20			
	10-19	.10	.17			
	19-29	---	---			

Table 24.--Chemical Soil Properties

(Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum	Salinity	Sodium adsorp-tion ratio
	Inches	meq/100 g	pH	Pct	Pct	mmhos/cm	
80:							
Remorris-------------	0-4	15-22	8.0-8.4	15-30	0	0.0-1.0	0-1
	4-7	---	---	---	---	---	---
	7-60	---	---	---	---	---	---
81:							
Moclom---------------	0-3	1.0-7.8	7.9-8.4	1-5	0	0.0-2.0	0
	3-5	---	---	---	---	---	---
	5-11	---	---	---	---	---	---
Simel----------------	0-1	8.1-16	7.9-8.4	10-15	0	0	0
	1-4	15-21	7.9-8.4	10-20	0	0	0
	4-10	14-31	7.9-8.4	5-15	0	0.0-2.0	0
	10-14	---	---	---	---	---	---
	14-24	---	---	---	---	---	---
83:							
Arches---------------	0-0	0.0-4.4	7.4-8.4	0-1	0	0	0
	0-3	0.0-4.2	7.4-8.4	0-1	0	0	0
	3-14	0.0-4.2	7.4-8.4	0-1	0	0	0
	14-15	0.0-7.4	7.4-8.4	0-1	0	0	0
	15-25	---	---	---	---	---	---
Pensom---------------	0-5	0.0-4.4	7.9-8.4	0-1	0	0	0
	5-11	0.0-4.2	7.9-8.4	0-5	0	0	0
	11-28	0.0-4.2	7.9-8.4	0-5	0	0	0
	28-37	---	---	---	---	---	---
85:							
Mident family--------	0-4	0.0-4.2	7.4-8.4	0-5	0	0	0
	4-9	0.0-4.2	7.9-8.4	0-5	0	0	0
	9-14	---	---	---	---	---	---
	14-24	---	---	---	---	---	---
Mido-----------------	0-4	0.0-4.2	7.9-8.4	0-5	0	0	0
	4-33	0.0-4.2	7.9-9.0	1-8	0	0	0
	33-79	0.0-4.0	7.9-9.0	1-8	0	0.0-2.0	0-2
86:							
Arches---------------	0-2	3.5-8.2	7.9-8.4	1-5	0	0	0
	2-10	3.4-8.0	7.9-8.4	1-5	0	0.0-2.0	0
	10-20	---	---	---	---	---	---
87:							
Arches---------------	0-4	1.0-4.2	7.9-8.4	1-4	0	0.0-2.0	0-2
	4-9	0.9-4.2	7.9-9.0	1-4	0	0.0-2.0	0-2
	9-13	0.9-4.2	7.9-9.0	1-4	0	0.0-2.0	0-2
	13-23	---	---	---	---	---	---
88:							
Crosscan family------	0-2	4.6-15	7.9-8.4	5-20	0	---	0-1
	2-4	8.4-15	7.9-8.4	10-30	0	---	0-1
	4-13	---	---	---	---	---	---
	13-23	---	---	---	---	---	---
89:							
Reef-----------------	0-4	8.8-13	7.9-8.4	5-10	0	0	0
	4-9	7.6-15	7.9-8.4	10-25	0	0	0-2
	9-19	---	---	---	---	---	---

Table 24.--Chemical Soil Properties--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum	Salinity	Sodium adsorp-tion ratio
	Inches	meq/100 g	pH	Pct	Pct	mmhos/cm	
91:							
Mido	0-4	0.0-4.2	7.4-8.4	0-3	0	0	0
	4-14	0.0-4.0	7.4-8.4	0-3	0	0	0
	14-55	0.0-7.4	7.9-8.4	0-5	0	0	0
	55-79	0.0-7.4	7.9-8.4	0-5	0	0	0
Mido, strongly calcareous	0-6	1.0-4.3	7.9-8.4	1-5	0	0	0
	6-24	0.9-4.2	7.9-8.4	1-5	0	0	0
	24-56	0.9-4.0	7.9-9.0	5-10	0	0.0-2.0	0-2
	56-60	0.9-7.4	7.9-9.0	5-10	0	0.0-2.0	0-2
	60-70	---	---	---	---	---	---
100:							
Arches	0-2	1.0-4.4	7.9-8.4	1-4	0	0	0
	2-4	0.9-7.6	7.9-8.4	1-5	0	0	0
	4-14	---	---	---	---	---	---
Rizno	0-1	4.6-8.9	7.9-8.4	1-5	0	0	0
	1-2	6.9-13	7.9-8.4	1-5	0	0	0
	2-6	6.6-12	7.9-8.4	1-5	0	0	0
	6-16	---	---	---	---	---	---
103:							
Mido, strongly calcareous	0-2	1.0-6.5	7.9-8.4	1-5	0	0	0
	2-19	0.9-6.3	7.9-8.4	1-5	0	0	0
	19-35	0.9-6.1	7.9-9.0	5-8	0	0.0-2.0	0-2
	35-68	0.9-6.1	7.9-9.0	5-8	0	0.0-2.0	0-2
	68-76	0.9-6.1	7.9-9.0	5-8	0	0.0-2.0	0-2
Mido	0-1	0.0-4.2	7.9-8.4	0-5	0	0	0
	1-15	0.0-4.2	7.9-9.0	0-5	0	0	0
	15-79	0.0-6.1	7.9-9.0	0-5	0	0.0-2.0	0-2
106:							
Retsabal	0-2	7.4-13	7.9-8.4	5-15	0-5	0.0-5.0	0
	2-7	7.6-12	7.9-8.4	5-20	5-15	0.0-5.0	0
	7-13	5.0-10	6.6-7.8	5-15	15-70	0.0-5.0	0
	13-21	---	---	---	25-100	---	---
	21-26	---	---	---	25-100	---	---
108:							
Milok	0-4	4.7-9.0	7.9-8.4	0-5	0	0	0
	4-18	6.1-15	7.9-9.0	3-15	0	0.0-2.0	0-2
	18-37	5.9-15	7.9-9.0	3-15	0	0.0-2.0	0-2
	37-52	5.9-15	7.9-9.0	5-15	0	0.0-2.0	0-2
	52-64	1.0-8.6	7.9-9.0	5-15	0	0.0-2.0	0-2
	64-73	1.0-8.6	7.9-9.0	5-15	0	0.0-2.0	0-2
Mido, strongly calcareous	0-5	1.0-6.4	7.9-8.4	0-5	0	0	0
	5-14	0.9-7.6	7.9-8.4	1-5	0	0	0
	14-44	0.9-7.6	7.9-8.4	1-5	0	0	0
	44-49	0.9-7.6	7.9-8.4	1-5	0	0	0
	49-73	0.0-4.2	7.9-9.0	0-5	0	0	0
	73-81	0.0-4.2	7.9-9.0	0-5	0	0	0

Table 24.--Chemical Soil Properties--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum	Salinity	Sodium adsorp-tion ratio
	Inches	meq/100 g	pH	Pct	Pct	mmhos/cm	
110:							
Bowington------------	0-1	0.0-3.0	7.9-8.4	1-10	0	0.0-1.0	0
	1-10	0.0-2.9	7.9-9.0	1-10	0	0.0-1.0	0
	10-25	0.0-2.9	7.9-9.0	1-10	0	0.0-1.0	0
	25-33	1.0-2.7	7.9-8.4	1-10	0	0.0-1.0	0
	33-38	1.0-2.7	7.9-8.4	1-10	0	0.0-1.0	0
	38-43	0.0-2.7	7.9-8.4	1-10	0	0.0-1.0	0
	43-48	0.0-2.7	7.9-8.4	1-10	0	0.0-1.0	0
	48-52	0.0-2.7	7.9-8.4	1-10	0	0.0-1.0	0
	52-79	0.0-2.7	7.9-8.4	1-10	0	0.0-1.0	0
Radnik---------------	0-5	3.5-9.9	7.9-9.0	1-5	0	0.0-1.0	0
	5-13	1.9-9.4	7.9-9.0	1-5	0	0.0-1.0	0
	13-23	1.8-9.1	7.9-9.0	1-5	0	0.0-1.0	0
	23-37	0.9-4.2	7.9-9.0	1-5	0	0.0-1.0	0
	37-43	0.9-4.2	7.9-9.0	1-5	0	0.0-1.0	0
	43-57	0.9-4.2	7.9-9.0	1-5	0	0.0-1.0	0
	57-83	0.9-4.2	7.9-9.0	1-5	0	0.0-1.0	0
Patterfield----------	0-6	10-16	8.5-9.4	5-15	0-3	16.0-30.0	13-30
	6-29	10-22	7.9-9.0	5-15	0-3	8.0-16.0	5-13
	29-40	10-22	7.9-9.0	5-15	0-3	8.0-16.0	5-13
	40-65	9.9-22	7.9-9.0	5-15	0-3	8.0-16.0	5-13
	65-79	9.9-22	7.9-9.0	5-15	0-3	8.0-16.0	5-13
111:							
Hanksville-----------	0-3	8.7-22	7.9-9.0	5-30	1-10	2.0-16.0	2-15
	3-19	8.4-22	8.5-9.6	5-30	1-10	8.0-20.0	5-40
	19-60	---	---	---	---	---	---
Persayo--------------	0-2	13-19	6.6-7.8	10-30	1-10	1.0-8.0	0-3
	2-8	14-19	6.6-7.8	5-30	1-10	1.0-8.0	0-3
	8-18	---	---	---	---	---	---
116:							
Begay, overwash------	0-4	3.0-9.3	7.9-8.4	5-10	0	0.0-1.0	0
	4-11	4.7-15	7.9-8.4	5-15	0	0.0-1.0	0
	11-24	4.6-15	7.9-8.4	5-15	0	0.0-1.0	0
	24-49	4.5-15	7.9-8.4	5-15	0	0.0-1.0	0
	49-72	4.5-13	7.9-8.4	5-15	0	0.0-1.0	0
117:							
Arches---------------	0-1	1.0-4.5	7.9-8.4	1-4	0	0	0
	1-4	1.7-6.4	7.9-8.4	1-5	0	0	0
	4-6	---	---	---	---	---	---
	6-16	---	---	---	---	---	---
118:							
Monue----------------	0-2	4.7-15	7.9-9.0	1-5	0-1	0.0-4.0	0-5
	2-6	8.6-15	8.5-9.0	1-5	0-1	0.0-4.0	0-5
	6-19	8.4-16	7.9-9.0	1-5	0-1	0.0-4.0	0-5
	19-33	8.1-15	8.5-9.0	5-15	0-1	0.0-4.0	0-5
	33-36	8.1-15	8.5-9.0	5-15	0-1	0.0-4.0	0-5
	36-79	---	---	---	---	---	---
119:							
Persayo--------------	0-2	5.4-9.7	7.4-8.4	5-15	0-10	2.0-4.0	0-3
	2-10	9.5-19	7.9-8.4	5-10	0-10	2.0-4.0	0-3
	10-16	9.1-18	7.9-8.4	1-5	0-10	2.0-4.0	0-3
	16-26	---	---	---	---	---	---

Table 24.--Chemical Soil Properties--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum	Salinity	Sodium adsorp-tion ratio
	Inches	meq/100 g	pH	Pct	Pct	mmhos/cm	
119:							
Somorent family------	0-5	8.6-15	7.9-8.4	1-10	0	0	0
	5-9	8.4-20	7.9-8.4	5-15	0	0	0
	9-19	---	---	---	---	---	---
	19-29	---	---	---	---	---	---
126:							
Rizno----------------	0-2	2.1-9.0	7.9-8.4	1-5	0	0	0
	2-7	4.6-15	7.9-8.4	1-5	0	0	0
	7-13	4.3-15	7.9-8.4	1-5	0	0	0
	13-15	---	---	---	---	---	---
	15-25	---	---	---	---	---	---
Arches---------------	0-2	1.0-4.4	7.4-8.4	1-5	0	0	0
	2-11	0.9-4.2	7.4-8.4	1-8	0	0	0
	11-21	---	---	---	---	---	---
Mido-----------------	0-7	1.0-4.3	7.4-8.4	1-5	0	0	0
	7-23	0.9-4.2	7.9-8.4	1-5	0	0	0
	23-46	0.9-4.0	7.9-8.4	1-5	0	0	0
	46-73	0.9-4.0	7.9-8.4	1-5	0	0	0
127:							
Pocum family---------	0-4	4.7-13	7.9-8.4	5-10	0	0	0
	4-18	8.4-15	7.9-8.4	15-35	0	0	0
	18-23	---	---	40-75	0	0	0
	23-33	---	---	---	---	---	---
129:							
Milok----------------	0-1	8.8-15	7.9-8.4	10-15	0	0	0
	1-7	5.5-15	7.9-8.4	15-30	0	0	0
	7-19	5.5-15	7.9-8.4	15-30	0	0	0
	19-51	5.3-15	7.9-8.4	15-30	0	0.0-2.0	0
	51-79	2.8-8.8	7.9-8.4	5-10	0	0.0-2.0	0
132:							
Livan family---------	0-6	1.0-8.2	7.9-8.4	1-20	0	0.0-4.0	0
	6-27	1.0-7.8	7.9-8.4	1-20	0	0.0-4.0	0
	27-28	0.9-7.8	7.9-8.4	1-20	0	0.0-4.0	0
	28-35	0.9-7.8	7.9-8.4	1-20	0	0.0-4.0	0
	35-49	0.9-7.8	7.9-8.4	1-20	0	0.0-4.0	0
	49-79	0.9-7.8	7.9-8.4	1-20	0	0.0-4.0	0
133:							
Chedeski family------	0-4	5.4-14	7.9-8.4	5-10	0	0.0-2.0	0
	4-10	9.5-19	7.9-8.4	5-10	0	0.0-2.0	0
	10-19	9.3-18	7.9-8.4	5-10	0	0.0-2.0	0
	19-29	---	---	---	---	---	---

Table 25.--Water Features

(Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydro-logic group	Months	Water table Upper limit	Water table Lower limit	Ponding Frequency	Flooding Frequency
			Ft	Ft		
80:						
Remorris	D					
		Jan-Dec	---	---	None	None
81:						
Moclom	D					
		Jan-Dec	---	---	None	None
Simel	D					
		Jan-Dec	---	---	None	None
83:						
Arches	D					
		Jan-Dec	---	---	None	None
Pensom	A					
		Jan-Dec	---	---	None	None
85:						
Mident Family	D					
		Jan-Dec	---	---	None	None
Mido	A					
		Jan-Dec	---	---	None	None
86:						
Arches	D					
		Jan-Dec	---	---	None	None
89:						
Reef	D					
		Jan-Dec	---	---	None	None
91:						
Mido	A					
		Jan-Dec	---	---	None	None
Mido, strongly calcareous	A					
		Jan-Dec	---	---	None	None
100:						
Arches	D					
		Jan-Dec	---	---	None	None
Rizno	D					
		Jan-Dec	---	---	None	None
103:						
Mido, strongly calcareous	A					
		Jan-Dec	---	---	None	None
Mido	A					
		Jan-Dec	---	---	None	None

Table 25.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Months	Water table Upper limit	Water table Lower limit	Ponding Frequency	Flooding Frequency
			Ft	Ft		
106:						
Retsabal	D					
		Jan-Dec	---	---	None	None
108:						
Milok	A					
		Jan-Dec	---	---	None	None
Mido, strongly calcareous	A					
		Jan-Dec	---	---	None	None
110:						
Bowington	B					
		January	1.6-3.3	>6.0	None	None
		February	1.6-3.3	>6.0	None	None
		March	1.6-3.3	>6.0	None	None
		April	1.6-3.3	>6.0	None	None
		July	1.6-3.3	---	None	Frequent
		August	1.6-3.3	---	None	Frequent
		September	1.6-3.3	---	None	Frequent
Radnik	A					
		July	---	---	None	Occasional
		August	---	---	None	Occasional
		September	---	---	None	Occasional
Patterfield	B					
		July	---	---	None	Very rare
		August	---	---	None	Very rare
		September	---	---	None	Very rare
111:						
Hanksville	D					
		Jan-Dec	---	---	None	None
Persayo	D					
		Jan-Dec	---	---	None	None
116:						
Begay, overwash	A					
		Jan-Dec	---	---	None	None
117:						
Arches	D					
		Jan-Dec	---	---	None	None
118:						
Monue	A					
		Jan-Dec	---	---	None	None

Table 25.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Months	Water table: Upper limit	Water table: Lower limit	Ponding: Frequency	Flooding: Frequency
			Ft	Ft		
119:						
Persayo	D					
		Jan-Dec	---	---	None	None
Somorent Family	D					
		Jan-Dec	---	---	None	None
126:						
Rizno	D					
		Jan-Dec	---	---	None	None
Arches	D					
		Jan-Dec	---	---	None	None
Mido	A					
		Jan-Dec	---	---	None	None
127:						
Pocum Family	D					
		Jan-Dec	---	---	None	None
129:						
Milok	B					
		Jan-Dec	---	---	None	None
132:						
Livan Family	A					
		July	---	---	None	Occasional
		August	---	---	None	Occasional
		September	---	---	None	Occasional
133:						
Chedeski Family	D					
		Jan-Dec	---	---	None	None

Table 26.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that data were not populated.
no data in all columns will not display.)

Map symbol and soil name	Restrictive layer: Kind	Restrictive layer: Depth to top	Restrictive layer: Thickness	Restrictive layer: Hardness	Potential for frost action	Ris… Uncoa… stee…
		In	In			
80:						
Remorris	Paralithic bedrock	4-6	---	Moderately cemented	Moderate	Moder…
		6-20		Weakly cemented		
81:						
Moclom	Paralithic bedrock	3-4	---	Moderately cemented	Low	Low
	Lithic bedrock	4-20		Indurated		
Simel	Paralithic bedrock	4-20	---	Moderately cemented	Moderate	Moder…
	Lithic bedrock	10-20		Indurated		
83:						
Arches	Lithic bedrock	4-20	---	Indurated	Low	Low
Pensom	Lithic bedrock	20-39	---	Indurated	Low	Low
85:						
Mident Family	Paralithic bedrock	4-10	---	Moderately cemented	Low	Low
	Lithic bedrock	10-20		Indurated		
Mido	No restriction	---	---	---	Low	Low
86:						
Arches	Lithic bedrock	4-20	---	Indurated	Low	Low
87:						
Arches	Lithic bedrock	4-14	---	Indurated	Low	Low
88:						
Crosscan Family	Paralithic bedrock	4-10	---	Moderately cemented	Moderate	Low
	Lithic bedrock	10-20		Indurated		
89:						
Reef	Lithic bedrock	4-20	---	Indurated	Moderate	---

Table 26.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Ris
	Kind	Depth to top	Thickness	Hardness		Uncoa stee
		In	In			
91:						
Mido	Lithic bedrock	59-79	---	Indurated	Low	Low
Mido, strongly calcareous	Lithic bedrock	60-79	---	Indurated	Low	Low
100:						
Arches	Lithic bedrock	4-10	---	Indurated	Low	Low
Rizno	Lithic bedrock	4-10	---	Indurated	Moderate	Low
103:						
Mido, strongly calcareous	No restriction	---	---	---	Low	Low
Mido	No restriction	---	---	---	Low	Low
106:						
Retsabal	Paralithic bedrock	4-20	---	Weakly cemented	Moderate	---
		8-24		Moderately cemented		
108:						
Milok	No restriction	---	---	---	Moderate	Low
Mido, strongly calcareous	No restriction	---	---	---	Low	Low
110:						
Bowington	No restriction	---	---	---	Low	Low
Radnik	No restriction	---	---	---	Low	Low
Patterfield	No restriction	---	---	---	Moderate	Hig
111:						
Hanksville	Paralithic bedrock	4-20	---	Moderately cemented	Moderate	Moder
Persayo	Paralithic bedrock	4-20	---	Moderately cemented	Moderate	Moder
116:						
Begay, overwash	No restriction	---	---	---	Moderate	---
117:						
Arches	Lithic bedrock	3-10	---	Indurated	Low	---
	Paralithic bedrock	3-6		Moderately cemented		

Table 26.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Ris
	Kind	Depth to top	Thickness	Hardness		Uncoa stee
		In	In			
118:						
Monue	No restriction	---	---	---	Moderate	---
119:						
Persayo	Paralithic bedrock	4-16	---	Moderately cemented	Moderate	Moder
Somorent Family	Paralithic bedrock	4-20	---	Moderately cemented	Moderate	Moder
	Lithic bedrock	10-20		Indurated		
126:						
Rizno	Paralithic bedrock	7-13	---	Moderately cemented	Moderate	Low
	Lithic bedrock	11-20		Indurated		
Arches	Lithic bedrock	4-20	---	Indurated	Low	Low
Mido	No restriction	---	---	---	Low	---
127:						
Pocum Family	Petrocalcic	12-20	---	Strongly cemented	Moderate	Low
	Lithic bedrock	16-28		Indurated		
129:						
Milok	No restriction	---	---	---	Moderate	Moder
132:						
Livan Family	No restriction	---	---	---	Low	Low
133:						
Chedeski Family	Paralithic bedrock	10-20	---	Moderately cemented	Moderate	Low

Table 27.--Landscape, Parent Material, and Ecosite ID

Map symbol and soil name	Percent of map unit	Slope	Elevation	MAP	Landform	Geology	Parent material	Ec
	Pct	Pct	Ft	In				
80:								
Remorris-----------	85	5-45	4265-5085	9-11	Hill on dipslopes cuesta	Morrison Formation, Tidwell Member (Jurrassic)	Residuum weathered from shale and siltstone	Semideser Loam (Bl R035XY23
81:								
Moclom------------	30	2-15	4298-5446	9-11	Hill on dipslopes of cuesta	Morrison Formation, Salt Wash Member (Jurassic)	Colluvium derived from sandstone and/or residuum weathered from sandstone	Shallow S (Utah Ju R035XY01
Simel-------------	25	2-30	4298-5446	9-11	Cuesta	Morrison Formation, Salt Wash Member (Jurassic)	Colluvium derived from sandstone and/or residuum weathered from limestone and shale	Semideser Loam (Ut Blackbru
					Hill			
					Talus slope			
83:								
Arches------------	20	2-15	4190-5564	9-11	Shrub-coppice dune on cuesta	Entrada Formation, Moab Tongue Member (Jurassic)	Eolian sands derived from sandstone	Shallow S (Utah Ju R035XY01
Pensom------------	20	2-15	4190-5564	9-11	Dune on cuesta	Entrada Formation, Moab Tongue Member (Jurassic)	Eolian sands derived from sandstone	Shallow S (Utah Ju R035XY01
					Shrub-coppice dune on cuesta			
85:								
Mident family------	15	15-30	4121-5659	9-11	Shrub-coppice dune on cuesta	Entrada Formation, Moab Tongue Member (Jurassic)	Eolian sands derived from sandstone	Shallow S (Utah Ju R035XY01
					Mesa			
Mido--------------	15	15-30	4121-5659	9-11	Dune on cuesta	Entrada Formation, Main Body Member (Jurassic)	Eolian sands derived from sandstone	Semideser R035XY21
					Shrub-coppice dune on cuesta			
					Mesa			
86:								
Arches------------	50	2-15	3999-5417	9-11	Sand sheet on dipslopes of cuesta	Entrada Formation, Moab Tongue Member (Jurassic)	Eolian deposits derived from sandstone	Shallow S (Utah Ju R035XY01
					Shrub-coppice dune on dipslopes of cuesta			

Table 27.--Landscape, Parent Material, and Ecosite ID--Continued

Map symbol and soil name	Percent of map unit	Slope	Elevation	MAP	Landform	Geology	Parent material	Ec
	Pct	Pct	Ft	In				
87:								
Arches-------------	50	2-15	4318-5312	9-11	Cuesta	Navajo Formation (Jurassic)	Eolian sands derived from sandstone	Semideser Loam (Ut Blackbru
					Hillslope			
					Ledge			
88:								
Crosscan family----	75	5-30	4121-5308	9-11	Hill	Entrada Formation, Dewey Bridge Member (Jurassic)	Colluvium derived from sandstone and/or residuum weathered from sandstone	Semideser Loam (Ut Blackbru
					Hillslope			
					Structural bench			
89:								
Reef---------------	40	5-30	4042-5236	9-11	Hill on scarp slopes of cuesta	Wingate Formation (Triassic)	Residuum weathered from sandstone	Semideser Loam (Ut Blackbru
91:								
Mido---------------	80	5-30	4114-5505	9-11	Climbing dune	Sand Deposits (Quaternary)	Eolian sands derived from sandstone	Semideser R035XY21
					Dune			
					Shrub-coppice dune			
Mido, strongly calcareous--------	15	2-15	4114-5505	9-11	Interdune	Sand Deposits (Quaternary)	Eolian sands derived from sandstone	Semideser (Blackbr R035XY21
					Sand sheet			
100:								
Arches-------------	35	2-15	3957-5403	9-11	Hillslope on cuesta	Kayenta Formation (Triassic)	Eolian sands	Shallow S (Utah Ju R035XY01
					Ledge on cuesta			
					Mesa			
Rizno--------------	30	2-15	3957-5403	9-11	Ledge on cuesta	Kayenta Formation (Triassic)	Slope alluvium derived from sandstone	Shallow S (Utah Ju R035XY01
					Mesa			

Table 27.--Landscape, Parent Material, and Ecosite ID--Continued

Map symbol and soil name	Percent of map unit	Slope	Elevation	MAP	Landform	Geology	Parent material	Ec
	Pct	Pct	Ft	In				
103:								
Mido, strongly calcareous--------	80	2-8	4101-5413	9-11	Interdune Sand sheet	Eolian and Alluvial Deposits (Quaternary)	Eolian sands derived from sandstone	Semideser (Blackbr R035XY21
Mido---------------	15	2-15	4101-5413	9-11	Shrub-coppice dune on sand sheet	Eolian and Alluvial Deposits (Quaternary)	Eolian sands derived from sandstone	Semideser (Blackbr R035XY21
106:								
Retsabal-----------	85	2-15	4593-4921	9-11	Hill Hillslope	Paradox Formation (Pennsylvanian)	Eolian deposits derived from sandstone and/or residuum weathered from rock gypsum	Semideser (Mormont
108:								
Milok--------------	70	2-6	4573-5358	9-11	Sand sheet	Eolian and Alluvial Deposits (Quaternary)	Slope alluvium derived from sandstone and/or eolian sands derived from sandstone	Semideser (Fourwin R035XY21
Mido, strongly calcareous--------	25	5-15	4573-5358	9-11	Dune Sand sheet	Eolian and Alluvial Deposits (Quaternary)	Eolian sands derived from sandstone	Semideser Saltbush
110:								
Bowington----------	50	0-3	3957-4826	9-11	Flood-plain step	Alluvial Deposits (Quaternary)	Alluvium derived from sandstone	Semiwet F (Fremont R035XY01
Radnik-------------	25	0-6	3957-4826	9-11	High flood-plain step	Alluvial Deposits (Quaternary)	Alluvium derived from sandstone	Loamy Bot Sagebrus
Patterfield--------	20	0-6	3957-4826	9-11	High stream terrace	Alluvial Deposits (Quaternary)	Alluvium derived from sandstone and shale	Alkali Fl R035XY00
111:								
Hanksville---------	45	2-45	4301-4524	7-9	Hill	Mancos Formation (Cretaceous)	Residuum weathered from shale	Desert Sh Saltbush
Persayo------------	45	2-45	4301-4524	7-9	Hill	Mancos Formation (Cretaceous)	Residuum weathered from shale	Desert Cl

Table 27.--Landscape, Parent Material, and Ecosite ID--Continued

Map symbol and soil name	Percent of map unit	Slope	Elevation	MAP	Landform	Geology	Parent material	Ec
	Pct	Pct	Ft	In				
116:								
Begay, overwash----	90	0-2	4751-5371	9-11	Sand sheet	Eolian and Alluvial Deposits (Quaternary)	Alluvium derived from sandstone and/or eolian deposits derived from sandstone	Semideser (Fourwin R035XY21
117:								
Arches-------------	25	2-15	3957-5522	9-11	Mesa	Navajo Formation (Jurassic)	Eolian deposits derived from sandstone	Shallow S (Utah Ju R035XY01
118:								
Monue--------------	90	1-6	4268-4534	7-9	Fan remnant on cuesta scarp	Alluvial and Colluvial Deposits (Quaternary)	Alluvium over slope alluvium over bouldery colluvium derived from sandstone and shale	Desert St (Shadsca Sagebrus
119:								
Persayo------------	50	15-70	4272-4918	7-9	Hill on eroded scarp slopes of cuesta	Lower Mancos Shale (Cretaceous), Ferron Sandstone Member of Mancos Shale (Cretaceous), and Brushy Basin Member of Morrison Formation (Jurassic)	Residuum weathered from shale	Desert Sh (Shadsca
Somorent family----	40	15-35	4272-4918	7-9	Dipslopes of cuesta	Cedar Mountain and Dakota Formations (Cretaceous)	Residuum weathered from sandstone	Desert Sh (Blackbr R035XY13
126:								
Rizno--------------	60	2-15	4071-5374	9-11	Cuesta Mesa	Navajo Formation (Jurassic)	Reworked eolian deposits derived from sandstone	Semideser Loam (Bl R035XY23
Arches-------------	20	2-15	4071-5374	9-11	Cuesta Dune on mesa Shrub-coppice dune on mesa	Navajo Formation (Jurassic)	Eolian deposits derived from sandstone	Shallow S (Utah Ju R035XY01
Mido---------------	10	6-15	4071-5374	9-11	Cuesta Dune on mesa	Navajo Formation (Jurassic)	Eolian sands derived from sandstone	Semideser Saltbush

Table 27.--Landscape, Parent Material, and Ecosite ID--Continued

Map symbol and soil name	Percent of map unit	Slope	Elevation	MAP	Landform	Geology	Parent material	Ec
	Pct	Pct	Ft	In				
127:								
Pocum family-------	95	2-8	4675-5312	9-11	Mesa	Kayenta Formation (Triassic)	Eolian sands derived from sandstone	Semideser Loam (Bl R035XY23
129:								
Milok--------------	75	2-15	4268-5023	9-11	Hill	Gravel Deposits (Quaternary)	Alluvium derived from sandstone	Semideser (Blackbr R035XY21
132:								
Livan family-------	85	0-6	4009-4760	9-11	Drainageway	Alluvial Deposits (Quaternary)	Alluvium derived from sandstone	Sandy Bot Saltbush
					Low terrace			
133:								
Chedeski family----	90	15-60	3960-5253	9-11	Canyon wall	Chinle, Wingate, and Kayenta Formations (Triassic)	Colluvium derived from sandstone	Semideser Loam (Ut Pinyon),
					Scarp slope on cuesta			

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SOIL SURVEY OF ARCHES NATIONAL PARK, UTAH
BIG BEND QUADRANGLE
SHEET NUMBER 6 OF 8

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, at the request of the Department of Interior, National Park Service. Base maps are orthophotographs prepared by the U.S. Department of Agriculture, Farm Service Agency, from 2006 aerial photography. Cultural information were acquired from USGS topo maps and other sources. Hydro information was derived from USGS topo maps and orthophotography.
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Kilometers: 0 1.25 2.5 5

Feet: 0 3,750 7,500 15,000

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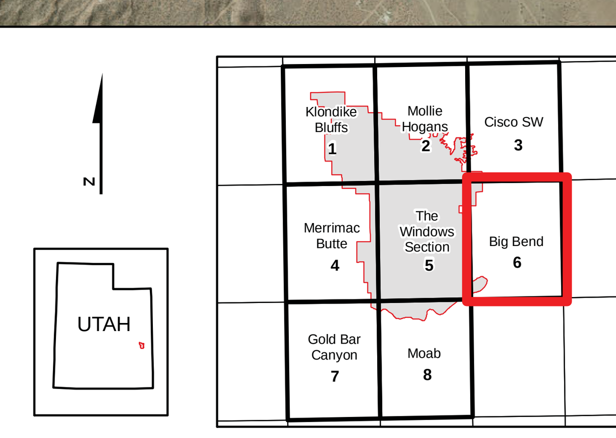

ARCHES NATIONAL PARK, UTAH

SHEET 6 OF 8

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SOIL SURVEY OF ARCHES NATIONAL PARK, UTAH
CISCO SW QUADRANGLE
SHEET NUMBER 3 OF 8

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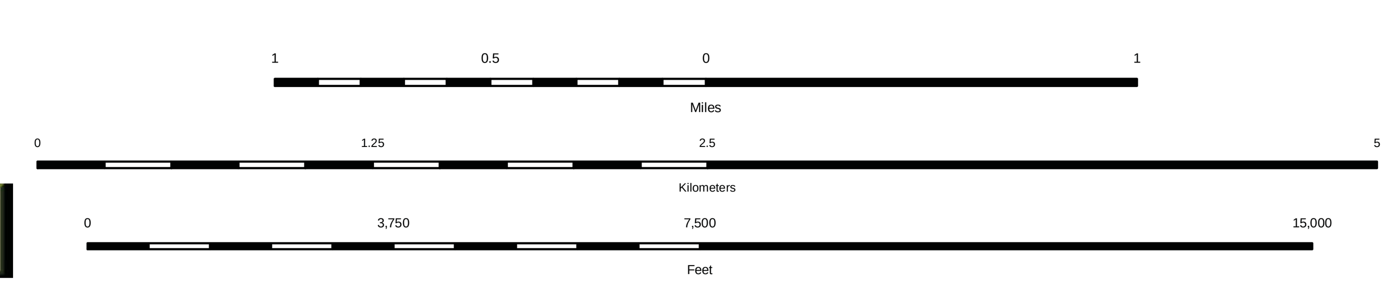

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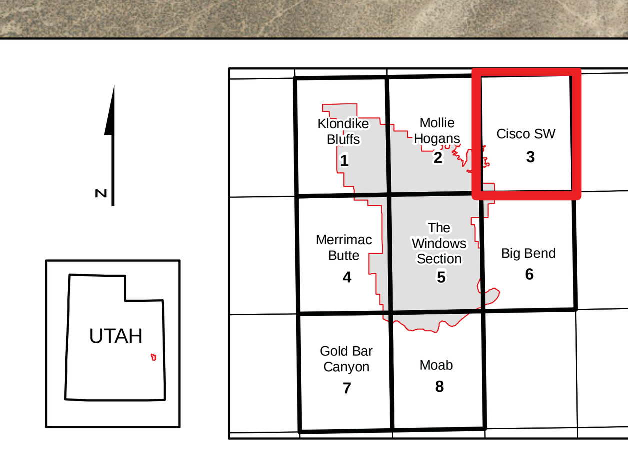
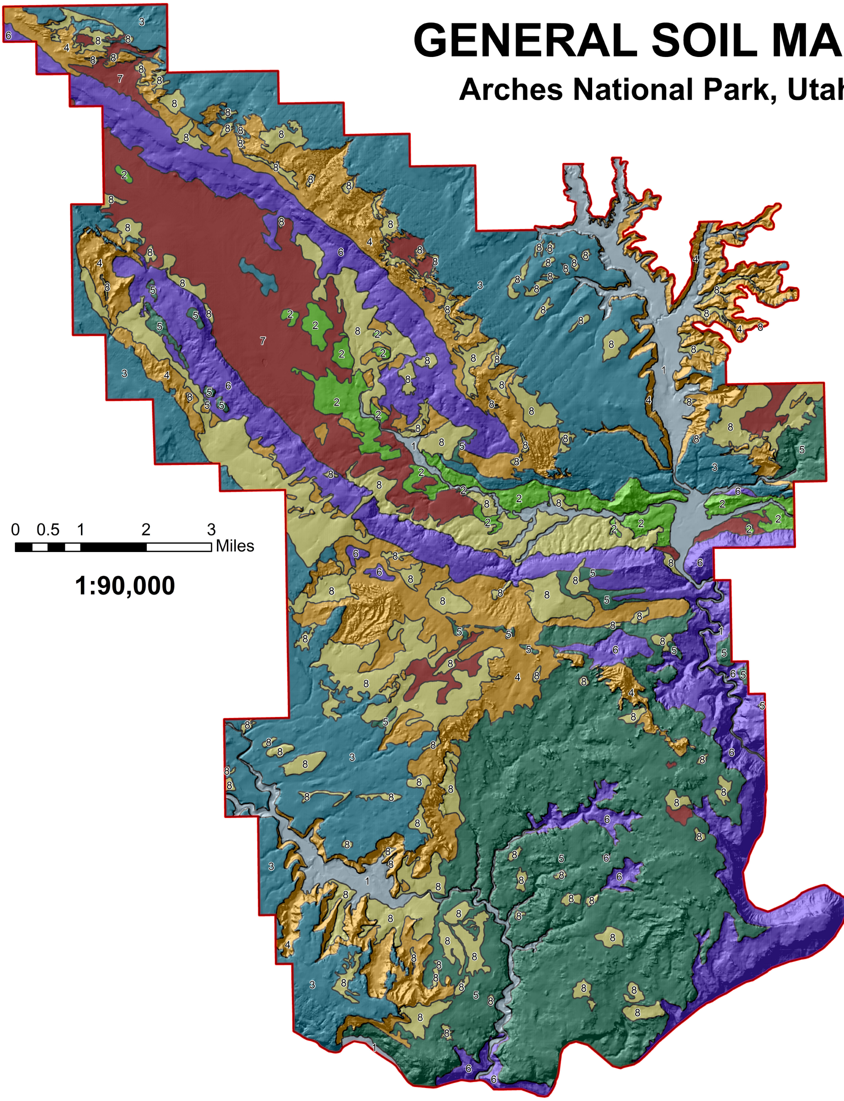


ARCHES NATIONAL PARK, UTAH

SHEET 3 OF 8

GENERAL SOIL MAP

Arches National Park, Utah



Legend

Alluvial soils on flood-plain steps and terraces, and in drainageways

1. Bowington-Livan family-Radnik complex

Residual soils formed in deposits from salt dome collapse

2. Persayo-Retsabal-Somorent family complex

Soils formed in eolian deposits on cuestas

3. Rock Outcrop-Arches-Pensom, moderately deep complex

Soils associated with Entrada Formation, Main Body (Slick Rock) and Dewey Bridge Members sandstone

4. Rock Outcrop-Crosscan family-Mido complex

Soils formed in shallow eolian deposits on Navajo Formation sandstone mesas and cuestas

5. Rock Outcrop-Rizno-Arches complex

Soils associated with scarp slopes of cuestas and canyon walls

6. Arches-Chedeski family-Rizno complex

Soils associated with mixed alluvial and eolian deposits in sand sheets

7. Milok-Begay-Mido complex

Soils associated with areas of deep eolian deposits

8. Mido-Mido, strongly calcareous complex

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SOIL SURVEY OF ARCHES NATIONAL PARK, UTAH
GOLD BAR CANYON QUADRANGLE
SHEET NUMBER 7 OF 8

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Miles

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Kilometers

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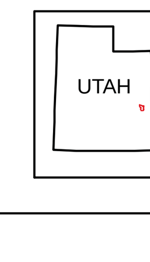

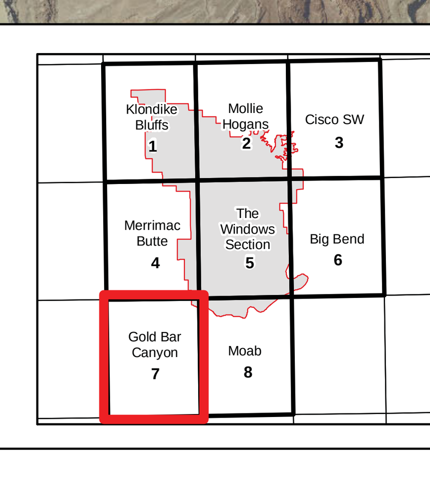

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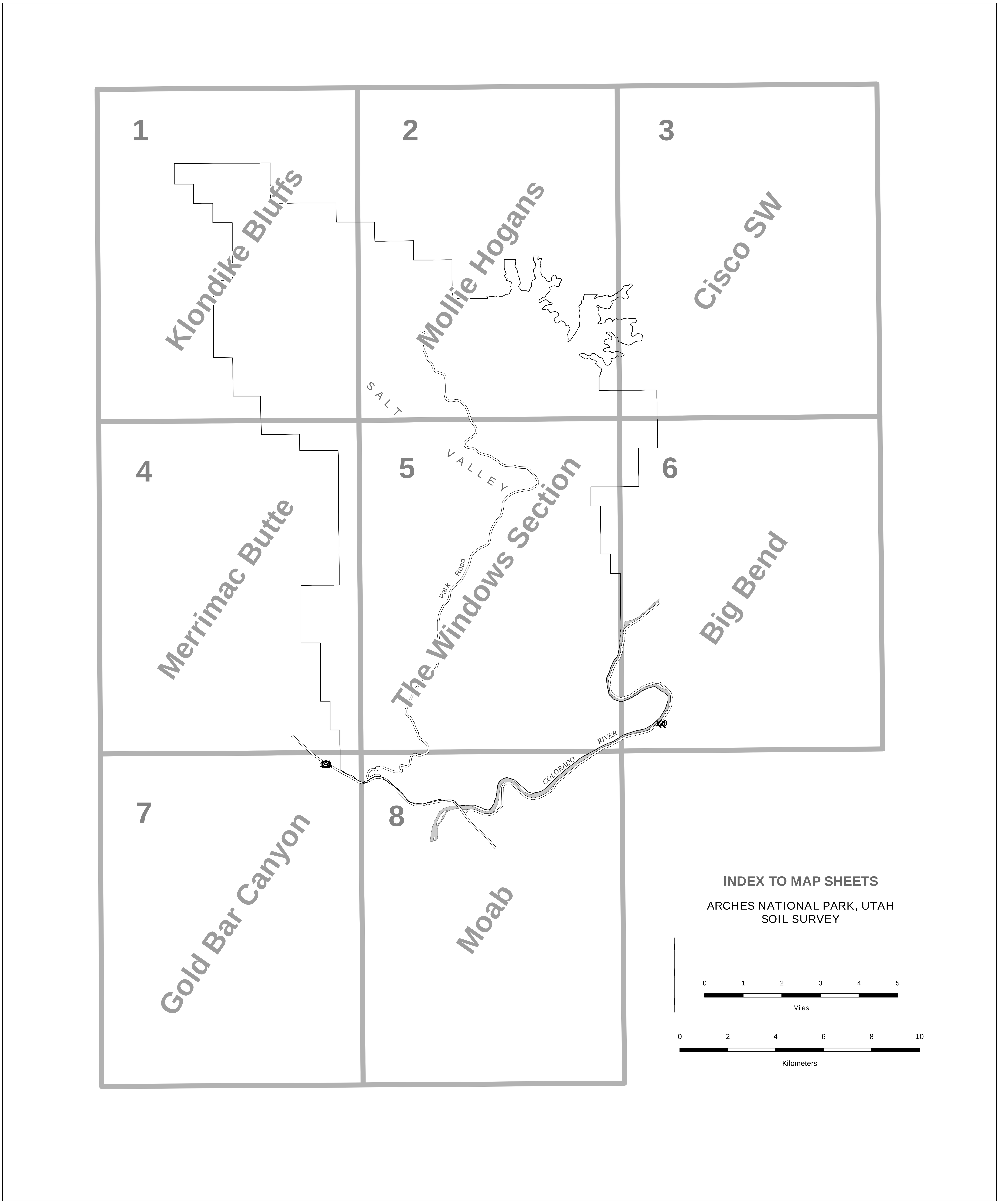
SHEET 7 OF 8


1
2
3
Klondike Bluffs
Mollie Hogans
Cisco SW
SALT
VALLEY
4
5
6
Merrimac Butte
The Windows Section
Big Bend
Park Road
COLORADO
RIVER
7
8
Gold Bar Canyon
Moab
INDEX TO MAP SHEETS
ARCHES NATIONAL PARK, UTAH
SOIL SURVEY
0 1 2 3 4 5
Miles
0 2 4 6 8 10
Kilometers

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Miles: 1 0.5 0 1

Kilometers: 0 1.25 2.5 5

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UNITED STATES DEPARTMENT OF INTERIOR
NATIONAL PARK SERVICE
UTAH AGRICULTURAL EXPERIMENT STATION

GEND

NAME

ercent slopes
mel complex, 2 to 30 percent slopes
nsom, moderately deep complex, 2 to 15 percent slopes
ily-Mido complex, 15 to 30 percent slopes
mplex, Entrada Formation, 2 to 15 percent slopes
mplex, 2 to 15 percent slopes
tcrop complex, 5 to 30 percent slopes
lex, 5 to 30 percent slopes
areous complex, 2 to 30 percent slopes
rop complex, 2 to 15 percent slopes
s-Mido complex, 2 to 15 percent slopes
loam, 2 to 15 percent slopes
areous complex, 2 to 15 percent slopes
field complex, 0 to 6 percent slopes
lex, 2 to 45 percent slopes
0 to 2 percent slopes, overwash
mplex, 2 to 15 percent slopes
e sand, 1 to 6 percent slopes
complex, 15 to 70 percent slopes
lex, 2 to 15 percent slopes, very rocky
cent slopes
loam, 2 to 15 percent slopes, eroded
ent slopes
0 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

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SOIL SURVEY OF ARCHES NATIONAL PARK, UTAH
MERRIMAC BUTTE QUADRANGLE
SHEET NUMBER 4 OF 8

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NRCS Natural Resources Conservation Service

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Kilometers

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Feet

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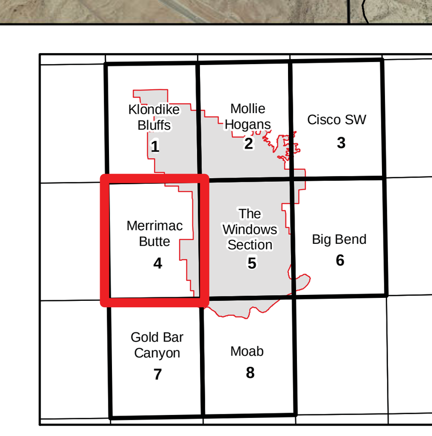
UTAH



ARCHES NATIONAL PARK, UTAH

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SOIL SURVEY OF ARCHES NATIONAL PARK, UTAH
MOAB QUADRANGLE
SHEET NUMBER 8 OF 8

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NRCS Natural Resources Conservation Service

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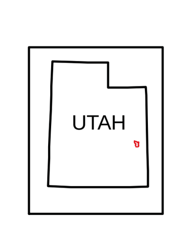

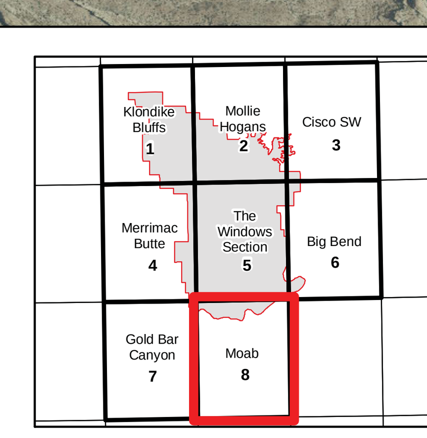

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SOIL SURVEY OF ARCHES NATIONAL PARK, UTAH
MOLLIE HOGANS QUADRANGLE
SHEET NUMBER 2 OF 8

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Kilometers

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Feet

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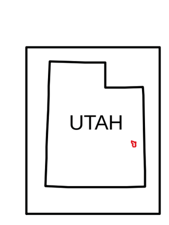

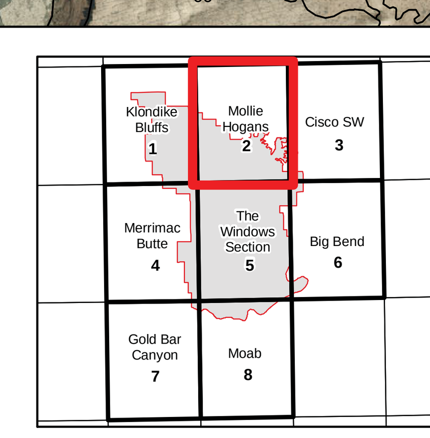

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SOIL SURVEY OF ARCHES NATIONAL PARK, UTAH
THE WINDOWS SECTION QUADRANGLE
SHEET NUMBER 5 OF 8

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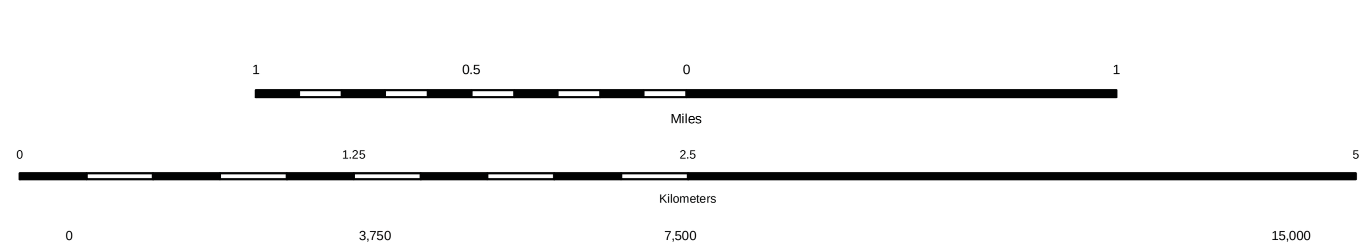

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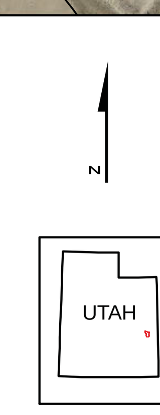

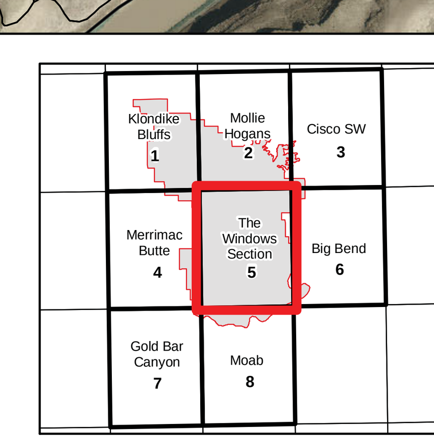

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